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A STUDY OF PRESENT WATER QUALITY IN THE UPPER SAVANNAH RIVER AND PRESENT AND FUTURE CONDITIONS AFFECTING WATER SUPPLY AND WASTE DISPOSAL IN THE CLEMSON AREA IN CONNECTION WITH THE HARTWELL RESERVOIR PROJECT

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November 1956

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A Study of Present Water Quality in the Upper Savannah River and Present and Future Conditions Affecting Water Supply and Waste Disposal in the Clemson Area in connection with

THE HARTWELL RESERVOIR PROJECT

Prepared By

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Study results are presented for water quality in the upper Savannah River between the Hartwell Dam site and the upper limits of Clark Hill Reservoir and of the effects of the dam on the water supply and waste disposal conditions at Clemson, South Carolina. Field studies were conducted in the fall of 1955, and included stream sampling and waste effluent sampling. The section of the Savannah River investigated was found to have a low organic pollution load and a high dissolved oxygen content. Sewage pollution prevented bathing or recreational use of the river. Recommendations are made to protect the Clemson water supply.

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SUMMARY AND CONCLUSIONS

1. This report presents the results of a study of present water quality in the upper Savannah River between the Hartwell Dam site and the upper limits of Clark Hill Reservoir and of the effects of the Hartwell Dam on the water supply and waste disposal conditions at Clemson, South Carolina. Field studies were conducted in the fall of 1955, and included stream sampling and waste effluent sampling, in the regions affected.

2. The section of the Savannah River investigated was found to have a low organic pollution load and a high dissolved oxygen content. Evidence of sewage pollution was present to such an extent that areas in this section of the Savannah River are not suitable for bathing or other recreational purposes. Coliform bacteria concentrations are above those recommended as suitable for a source of domestic water supply.

3. Sources and magnitudes of existing waste sources and observed water quality under flow conditions occurring during the survey indicate that, except for bacterial quality, existing waste loads will not noticeably damage water quality under other natural flow conditions which can be expected.

4. The present Clemson water supply is taken from the Seneca River, which shows evidence of sewage pollution at the Clemson waterworks intake. The coliform bacteria concentrations observed during the survey were above those recommended as suitable for a public water supply. Historical records from the water plant indicate frequent occurrence of such conditions.

5. Untreated sewage from Clemson is discharged into the Seneca River. During the reservoir construction it is proposed to collect all wastes to a point of disposal about 4400 feet below the water intake. Extent of required treatment is under consideration. The water intake will be reconstructed near its present location.

6. The presence of the reservoir arm should not cause a deterioration of the water supply under normal flow conditions.

7. Abnormal flow conditions in the reservoir arm conceivably may cause upstream flow near the water intake and sewage outfall. If untreated sewage were discharged, possible damage to the water supply at the intake could occur. The frequency or degree of such damage is not predictable.

8. Under present conditions wastes from the Clemson area cause high bacterial pollution in the lower Seneca and upper Savannah Rivers.

9. Under present conditions treatment of waste originating above Clemson would be recommended to protect the Clemson water supply. This recommendation would be unaffected by the reservoir construction.

10. Also under present conditions a minimum of primary treatment and postchlorination for Clemson wastes would be considered desirable to avoid unreasonable pollution of the stream. Such pollution interferes with other uses and causes damage to aesthetic values.

11. Under reservoir conditions a minimum of primary treatment with provision for chlorination for the Clemson wastes would be recommended to assure protection to the Clemson Water supply, to preserve aesthetic values, and to make the reservoir arm suitable for recreational uses, including boating and fishing.

INTRODUCTION

The Hartwell Dam and Reservoir project is under construction by the Corps of Engineers. The dam is located on the Upper Savannah River near Hartwell, Georgia. Impoundment of water behind the dam and operation for flood control, power, and other purposes conceivably may have effects on water supplies and waste disposal in the area.

In recognition of these possibilities the Savannah District Office of the Corps of Engineers requested the Public Health Service to investigate certain aspects of these features and prepare a report of the findings.

Specifically, the purposes of the study were to investigate the present water quality in the Savannah River above the existing Clark Hill Reservoir limits and below the Hartwell Dam Site and to investigate the water supply and waste disposal situation in the Clemson, South Carolina, area, particularly with respect to effects of the impoundment on waste treatment requirements for Clemson. The study is not concerned with what the future water quality or stream characteristics may be in the Savannah River below the dam. Neither is it concerned with what effects, if any, the project may have on water supply or waste disposal situations in the reservoir area other than in the Clemson area.

Although the study was not concerned with sanitary conditions in tributaries, investigations were made on individual sources of waste and on the tributary streams in order to assist in evaluation of water quality conditions found in the main stem of the Savannah River and in the Seneca River in the Clemson area.

Field studies were carried out in the period from November 1, 1955, through December 9, 1955, using mobile laboratories and personnel of the Public Health Service and the South Carolina Water Pollution Control Authority.

ACKNOWLEDGMENTS

Cooperation and assistance in the field study and assembly of supplemental information were furnished by personnel of Federal, State, and local agencies, and by industrial representatives.

The South Carolina Water Pollution Control Field Unit assisted in furnishing information on sources of wastes and participated in the sampling and analytical work. This much needed cooperation and assistance is greatly appreciated.

The Division of Water Pollution Control, Georgia Department of Public Health, provided information from their files concerning sources of waste in Georgia.

The Duke Power Company, Anderson, S. C., provided the parking space and utilities connections, required for the mobile laboratories.

The South Carolina and Georgia offices of the U. S. Geological Survey provided personnel and assistance in obtaining flow data during the survey. Also, information on past flows of record was taken from the Geological Survey's publications.

The U. S. Weather Bureau supplied information on weather conditions in the area, particularly with respect to wind directions and velocity.

The Savannah District Office of the U. S. Army Corps of Engineers supplied information and maps of the reservoir area. Other maps of the area were obtained from the State Highway Departments of S. Carolina and Georgia.

Industries and municipalities in the area were very helpful in providing information about their operations and the wastes discharged.

Information on raw water quality was obtained through the State of South Carolina from water plant records at Clemson.

All assistance and cooperation is gratefully acknowledged.

DESCRIPTION OF THE AREA

General

The Savannah River at Hartwell drains an area of about 2200 square miles, encompassing the northwest part of South Carolina, the northeast corner of Georgia, and southwestern parts of North Carolina. The Savannah River is formed by the confluence of the Tugaloo River and the Seneca River at a point 7.1 miles upstream from the location of Hartwell Dam. The Tugaloo River rises in North Carolina, flows south for a short distance in Georgia, and then flowing southeast, becomes the interstate boundary between Georgia and South Carolina until its confluence with the Seneca River. It drains an area of 905 square miles. The Seneca River also has its headwaters in North Carolina; it flows south through South Carolina until it meets the Tugaloo, draining an area of 1,026 square miles.

The region concerned in this study lies in the rolling hills of the Southeastern Piedmont. The economy of this area is based primarily on agriculture and the textile industry, although lumber products and clay products are important in some sections. There are no large towns in this part of the Savannah basin, but there are numerous small ones. Anderson, S. C., is the largest, having a population of 19,770; others are Seneca, S. C., population 3,649, Toccoa, Ga., population 6,781, Hartwell, Ga., population 2,964, and Clemson, S. C., population 6200 (including Clemson College).

Sources of Waste

Table I contains a list of the sources of waste which conceivably could have some bearing on the study. Figure 3 shows the relative locations of these sources of waste. Many of the waste sources investigated were quite small so that extensive sampling and laboratory analyses were not required to ascertain that their effects on the Main River would be insignificant.

Most of the sewage treatment which is provided consists of septic tanks or Imhoff tanks. The town of Anderson has two primary sewage treatment plants having mechanically cleaned sedimentation basins, separate sludge digestion, and sludge drying beds. These plants receive most of the domestic wastes originating in the community.

In general, industrial wastes are discharged untreated to the nearest convenient water course.

In the Clemson area the Seneca River serves as a source of water supply and as a receiving stream for waste discharge. Most of the sewage is discharged untreated in four outfalls located below the raw water intake. About 150 homes are tributary to two septic tanks, the outfalls of which reach the Seneca River a short distance above the water intake. Revisions to the sewer system are proposed which will collect the sewage to a point of discharge about 4400 feet below the water intake. The water intake is to be revised in its present approximate location to accomodate changed conditions caused by the reservoir. Information on the Clemson area is shown in Figure 4.

Water Supply

The only water supply of concern in this study is the supply for the Clemson area which is obtained from the Seneca River. The location of the intake with respect to sewer outfalls has been discussed in the preceding section of the report. The raw water is delivered to a treatment plant which provides coagulation, sedimentation, filtration, disinfection, and taste and odor control and corrosion control.

Hartwell Reservoir

The Hartwell Dam is being constructed on the Savannah River between Hartwell, Georgia and Anderson, South Carolina. At full flood control pool the reservoir will extend 7.1 miles up the Savannah River to the confluance of the Tugaloo and Seneca Rivers; 42 miles up the Tugaloo River to within about one mile of the existing Yonah Dam, 27 miles up the Seneca River to the mouth of Little River and 7.2 miles up the Keowee River and 8.3 miles up Deep Creek. The outlines of the impoundment at full flood control pool are shown on Figure 1.

The Seneca arm of the reservoir will extend past Clemson so that the water intake and sewage outfalls of this community will be in the same arm of the reservoir less than one mile apart.

It appears quite likely that the reservoir will promote considerable recreational developments in the area. As a consequence, recreational uses will have a bearing on desirable pollution control measures.

FIELD INVESTIGATIONS AND PRESENTATION OF DATA

Selection of Sampling Stations

The primary objective of the field investigations was the collection of stream quality data, related information regarding sources of pollution and water uses, and stream flow data for the region concerned. The sampling was carried out during the month of November, 1955, and the first week of December, 1955.

In addition to measuring residual effects of wastes on downstream water quality, stream sampling was designed to supplement information obtained at the sources on magnitude of waste loads discharged. In some instances multiple waste outlets from various sources in an area made it impractical to measure all waste loads as discharged. Watercourse sampling immediately below the cumulative waste effluents from an area provided a check on estimated waste loads based on population and industrial production information. In other instances, where information on population or industrial plants indicated that waste loads were minor, the stream sampling provided verification that such was the case.

During the field study 268 samples were collected from 35 sampling points on the Savannah River and its tributaries. In addition composite samples over a 24-hour period were taken at three textile plants in the vicinity of Clemson, S. C., and at two sewage treatment plants at Anderson, S. C.. In general, residual pollution loads in tributary streams were measured as they entered the Tugaloo and Seneca Rivers and the Savannah River above its confluence with the Broad River. Also, loads in the Seneca and Tugaloo Rivers were measured near their mouths before they join to form the Savannah River. In addition, as indicated previously, streams were sampled immediately below areas of pollution where needed to provide a check on the magnitude of waste load discharged. The complete list of sampling stations and their locations are presented in Table II and Figure 2.

Sampling Methods

Stream samples were collected semi-weekly at stations on the main rivers and the major tributaries, except when road conditions prevented, to a maximum of nine samples at a given station for the duration of the survey. Some of the smaller tributaries were sampled on a weekly basis. The set of individual samples taken at each station consisted of standard bottles for dissolved oxygen, biochemical oxygen demand, coliform density, and a two-quart portion for other chemical analyses.

The sample collector recorded for each sample the time of day the sample was collected, water temperature, gage readings to determine the flow, and the dissolved oxygen content of the sample. Samples were transported in ice-cooled carrying chests and subjected to analysis the same day they were received at the laboratory; laboratory determinations were usually started within six hours after the collection of a sample.

The twenty-four-hour composite waste samples were made up by collecting separate portions proportioned on the basis of flow meter readings at the time of sampling, taken at one-hour to one-and-one-half-hour intervals during the twenty-four hour period, and all poured into a container carried in an ice-cooled chest. The analysis of these samples was begun within three hours after the last sample was taken.

The final effluents of the two sewage treatment plants, which provide primary treatment, were sampled in this manner, as was the waste effluent from the Excelsior Finishing Mill and the Utica-Mohawk plant near Clemson, S. C. The La France plant had no single effluent outfall, so Twenty-three-mile Creek was sampled immediately above and below the plant.

Laboratory Analyses

Routine laboratory tests were considered adequate to evaluate the sanitary quality of the streams in this area. Determinations made on each stream sample were color, pH, alkalinity, chlorides, dissolved oxygen, biochemical oxygen demand, and coliform density. In addition, samples taken from stations on the Savannah River and those nearest the mouths on the Tugaloo and the Seneca Rivers (Stations 1, 4, 5, 7, 9, 10) were subjected to determinations for iron and manganese.

The twenty-four hour composite samples of industrial effluent and sewage treatment plant effluent were subjected to determinations of pH, alkalinity, dissolved oxygen, and biochemical oxygen demand.

All tests were performed according to the procedures described in "Standard Methods for the Examination of Water, Sewage, and Industrial Wastes," Tenth Edition, 1955, A. P. H. A.

The analytical results obtained during the sampling are presented in Table III.

Other Sources of Data

Staff gage readings taken during the sampling period were converted to flows by U. S. Geological Survey personnel or on the basis of rating curves furnished by them.

Information on products manufactured, production volume, volume of waste effluent, and other information was obtained from industry by State personnel in South Carolina and by PHS personnel in Georgia. This information was used in estimating waste loads and in supplementing information obtained from stream and waste sampling.

Table I contains summary information on the magnitudes of waste loads in the area and the treatment provided. It is emphasized that estimates of organic waste loads from industrial plants are based on current production data furnished by the industries and that these loads may be expected to vary considerably over a period of time.

Results of laboratory analysis and flow data are presented in Table III. Average results of water quality analysis for the Savannah River are presented in Table IV. Table VII is a similar summary for the Clemson area.

Information was obtained over a long period of record on relative flows in the Seneca and Tugaloo Rivers in connection with the possibility that back-flow conditions could be caused in the Seneca River under certain reservoir operation conditions. The information is not presented since, as will be discussed later, the record does not indicate this factor is significant.

Records on direction and velocity of wind in the reservoir area were obtained from the U. S. Weather Bureau. This information is shown in Table VI.

In order to compare flow conditions during the survey with flows of record selected data were taken from U. S. Geological Survey publications for the ten-year period 1943 - 1953 on the Savannah River near Calhoun Falls, S. C. The data are presented in Table V and Figure 5.

Supplemental information on bacterial water quality at the Clemson water intake was obtained from water plant records for a four year period. The data were not such as to permit an evaluation of maximum bacterial pollution and are not tabulated. They were useful in some measure as an indication of existing pollution as indicated under analysis of results.

ANALYSIS OF RESULTS

Savannah River.

This study is concerned with water quality in the Savannah River above the upper limits of Clark Hill Reservoir. The waste material eventually discharging into this reach of the river comes from widely separated sources.

Industrial wastes from sources in the drainage area above the Hartwell Dam Site primarily are from textile mills. These mills vary in size and type and the majority of them discharge only small amounts of waste. The few larger ones discharging waste loads in significant amounts have outfalls located on streams tributary to the Seneca and Tugaloo Rivers and are approximately 20 to 40 miles above the dam site. (See Figure 3). The most significant effect on water quality in the Savannah River at the dam site is from bacterial pollution originating in the Clemson area.

The wastes discharging into the Savannah River below the location of Hartwell Dam are, for the most part, carried to the river by tributary streams. The most significant effects result from bacterial pollution caused by discharge of domestic sewage from the municipalities of Anderson, Hartwell, Royston, Elberton, and Iva, although small amounts of industrial waste are also present. Except for two primary sewage treatment plants at Anderson and several small septic tanks and Imhoff tanks in the other towns, this sewage is untreated.

The data obtained at the four sampling stations on the Savannah River (Ref. Figure 2) are summarized in Table IV. These results indicate that, with respect to dissolved oxygen and organic loading, the water quality in the Savannah River was very good during the sampling period of this survey. The biochemical oxygen demand, averaging 1.6 ppm for all samples taken at the four stations, was no greater than normally could be expected for a watercourse which receives only the natural runoff from its drainage area. Dissolved oxygen was present to an average of 96 per cent of saturation, which is as high as could reasonably be expected in any river.

The mean of all results at the four sampling stations on the main river showed colifrom concentrations of 3500, 6100, 10,000 and 7300 (most probable numbers per 100 milliliters) at stations 1, 4, 5, and 7 respectively. Maximum concentrations were 46,000, 46,000, 110,000, and 24,000 respectively. Sources of the bacterial pollution are indicated by data on the tributaries. At the first station on the Seneca River above its confluence with the Tugaloo (Station 10) the maximum coliform concentration was greater than 110,000. At the station below Clemson (Station 15) the maximum concentration was 1,100,000. Station 6, near the mouth of Big Generosetee Creek, had a maximum concentration in the samples taken of 1,500,000. The coliform concentration near the mouth of Rocky River (Station 2) was not great under flow conditions encountered during the survey. However, at station 25, upstream on Rocky River, the

observed maximum concentration was 2,400,000. It can be expected that larger concentrations than those observed will occur at the mouth of Rocky River. The observed bacterial pollution in this reach of the Savannah River is greater than that considered suitable for recreational purposes or as a source of public water supply.

Dissolved iron and manganese are present in the river at concentrations greater than would be desirable in a finished public drinking water supply. Maximum concentrations of iron observed were slightly greater than one part per million. The maximum manganese concentration was 0.40 parts per million.

Color measurements on samples from the four Savannah River stations gave results ranging from 10 to 60 parts per million, platinum cobalt standards. The average value for all samples was 26. The water had a yellowish appearance to the eye.

The chlorides and alkalinity were low. The pH values indicate that the river water is practically neutral.

Flow in the Savannah River during the sampling period was very low. Data for ten years from the U. S. Geological Survey gaging station near Calhoun Falls, S. C., shown in Table V, show that the lowest daily flow in the Savannah River at this point during the ten-year period was 1030 cfs. The average daily flow for the minimum month during the period was 1728 cfs. The average flow at sampling times during this survey was 1750 cfs at the Calhoun Falls station.

Water quality measurements during the survey were taken during a period when there was relatively little fluctuation in stream flow. Consequently they do not reflect a direct measurement of quality over the range of flows which can be expected to occur. However, except for bacterial pollution, the minimal effect of existing pollution loads on the main stem of the Savannah River in the reach under consideration, as reflected by stream sampling, indicates that the effect will be small under other flow conditions. This conclusion, applying to the existing waste load situation, is supported by investigations of waste loads at their source.

With respect to bacterial pollution, it is possible that there will be conditions, such as sudden flow increase in tributary streams, when bacterial pollution will be higher than the conditions observed.

Observed concentrations of iron and manganese reflect only conditions observed during the survey period and do not necessarily represent values which may occur under other flow and seasonal conditions.

Clemson Area.

The situation with respect to waste sources in the drainage basin of the Seneca River above Clemson, waste discharge in the Clemson area, and the location of the Clemson water intake with respect to waste outlets have been discussed previously.

The data descriptive of water quality in the Clemson reach of the Seneca River are contained in Table III. The data are summarized in Table VII.

The watercourses in the drainage area above Clemson receive wastes from numerous industries and small communities. The tabulated data show that, except for bacterial pollution, the residual effects of municipal and industrial wastes discharged upstream have little damaging effect on water quality at the Clemson intake.

The data show excessive coliform concentrations above the water plant intake. That large numbers of coliform bacteria are present consistently at the intake is borne out by data made available from records of the Clemson water treatment plant. The data covered a period of four years operation. While these records do not contain information which permit an estimate of the maximum coliform concentrations which occurred, they do indicate numerous instances in which concentrations exceeded limits measured by the tests used.

The data taken during the survey show a maximum most probable number (MPN) per 100 milliliters of coliform organisms of 46000 and a logarithmic mean MPN for all results of 6,400. These values are indicative of excessive bacterial pollution.

Pertinent to this study is the water quality in the Seneca River below the water intake, since this area will all be in an arm of the Reservoir Pool after impoundment. Tables III and VII contain information on water quality at Station 15 below sewer outfalls in the area. These data show quite high bacterial pollution. Maximum coliform concentration was greater than 1,000,000 MPN/100 ml. The mean of all results was in excess of 105,000 MPN.

During construction of the Hartwell Dam it is proposed to relocate the water intake and sewer outfalls. The water intake will be moved only a short distance downstream from its present location. A collector sewer and outfall is proposed which will collect sewage and carry it to a point of treatment and outfall some 4400 feet below the water intake.

The Seneca River in the Clemson area will form one arm of Hartwell Reservoir as indicated in Figures 1 and 4. This arm will be a wide, deep, slowly flowing stream under normal conditions. Bacterial pollution at the Clemson water intake, caused by upstream wastes, should, if anything, be reduced by the new conditions due to longer travel time in the impounded water than now exists. This improvement will be particularly noticeable if septic tank outlets, now located above the intake, are in-

cluded in the outfalls to be picked up by the interceptor sewer.

In view of the relative positions of the water intake and the sewer outfall it was considered desirable to examine possible circumstances under which upstream flow could occur.

One factor which conceivably could have been influential in promoting upstream flow is the relative flows which could be expected in the Tugaloo and Seneca Rivers. An investigation of flow records along with consideration of pool volumes, indicates that differential flows in the Seneca and Tugaloo Rivers could not be expected to cause back flow past the water intake in the Seneca River.

Another possible condition in which upstream flow could occur would be with a high upstream wind, particularly if combined with a relatively warm reservoir surface and a cooler inflow to the reservoir. Information on wind velocities and direction were obtained from the U. S. Weather Bureau and are presented in Table VI. It is possible that the wind conditions could cause upstream surface movement in the reservoir past the water intake. The effects on water quality at the intake from untreated sewage discharged downstream can not be predicted as to intensity and frequency of occurrence. However assured protection of the water supply by provisions for sewage treatment is considered desirable.

Other reasons exist for requiring sewage treatment for waste from the Clemson area after impoundment. Aside from the consideration of bacterial pollution, removal of waste material which would float in the surface would be desirable from an aesthetic viewpoint in an area such as this and particularly in an area adjacent to a water intake. Moreover, it can be expected that the reservoir will be attractive for recreational uses. Treatment will be required to assure suitable water for such uses.

Under present conditions wastes from the Clemson area cause bacterial pollution in the lower Seneca River and a part of the upper Savannah to the extent that it is undesirable for recreational uses, including fishing. Also, aesthetic values are adversely affected. In such an area a minimum of primary treatment would ordinarily be considered desirable to avoid an unreasonable use of the stream.

Following is a summary of the situation in the Clemson area:

1. Treatment of sewage discharged above the Clemson water intake should be provided under present conditions for protection of the present supply.

2. Effects of the reservoir on the requirements for such treatment will, if anything, tend to lesser them.

3. Treatment of the Clemson wastes would be recommended, under present conditions, to a minimum of primary treatment with postchlorination, to avoid unreasonable bacterial pollution, to permit use of the stream for other purposes, and to preserve aesthetic values.

4. A possibility exists that, under certain conditions, upstream flow in the reservoir could occur and, if Clemson wastes are untreated, some damaging effects could occur to the Clemson water supply. The extent of such effects and frequency of occurrence are not predictable. A minimum of primary treatment and at least provisions for chlorination would be recommended to assure protection of the water supply.

5. After impoundment a minimum of primary treatment with chlorination would be desirable to permit extensive recreational uses and to preserve aesthetic values.

Table I. Sources of Waste Discharging into the Savannah River System

Town	Sewered Population	Industrial Waste(P.E.)(1)	Type of Treatment	Population Equivalent Served	Streams Receiving Waste	Estimated #BOD/day(2)
a. Municipalities in South Carolina						
Anderson	19,770	•	Primary	•	Rocky River to Savannah River	2600(4)
		•	Primary	•	Whitner Creek to Big Generosetee Ck. to Savannah River	3700(4)
Belton	1,500	180	Imhoff tank	1,680	Hen Coop Ck. to Wilson Ck. to Rocky River	170(5)
	1,500	some	Imhoff tank	1,600	Cupboard Ck. to Broadway Ck. to Rocky River	160(5)
Central	780	-	Imhoff tank	780	Eighteen Mile Ck. to Deep Ck. to Seneca River	85(5)
	400	none	Imhoff tank	400	Twelve Mile Ck. to Seneca River	40(5)
Clemson	5,400	none	2 septic tanks	200	Seneca River	-
			none	5,200	Seneca River	900(5)
Easley	small	none	septic tank	small	Eighteen Mile Ck.	small(5)
Iva	400	none	Imhoff tank	400	Wilson Ck.	40(5)
	700	20	septic tank, Imhoff tank	720	Canoe Ck. to Generosetee Ck.	83(5)
Liberty	1,200		3 septic tanks		Eighteen Mile Ck.	130(5)
	800	none	Imhoff tank	800	Golden Ck. to Twelve Mile Ck.	40(5)
Pickens	1,000	none	Imhoff tank	1,000	Wolf Ck. to Twelve Mile Ck.	110(5)
	1,000	none	2 septic tanks	1,000	Town Ck. to Twelve Mile Ck.	110(5)
Seneca	1,100	none	septic tank	1,100	Coneross Ck. to Seneca River	120(5)
	2,400	<300	septic tank	<2,700	Martin Ck. to Seneca River	260-310(5)
Walhalla	450	50	Imhoff tank	500	Coneross Ck.	58(5)
	2,560	none	none	2,560	Cane Ck. to Little River to Seneca River	430(5)
Westminster	1,200	some	2 Imhoff, 2 Septic	1,200	Coneross Ck.	130(5)
	550	slight	septic tnk, Imhoff tnk.	550	Choestoea Ck. to Tugaloo River.	60(5)

(continued) Table I. Sources of Waste Discharging into the Savannah River System

Town	Sewered Population	Industrial Waste(P.E.)[1]	Type of Treatment	Population Equivalent Served	Streams Receiving Waste	Estimated #BOD/day[2]
b. Municipalities in Georgia						
Elberton	8,000	none	none	4,000	Beaverdam Ck.	493[4]
			none	4,000	Broad River Basin	-
Hartwell	3,500	none	septic tank	150	Lightwood Log Ck. to Savannah River	17[5]
			none	1,700	Cedar Ck.	280[5]
			none	1,100	Little Cedar Ck.	180[5]
			none	550	Lightwood Log Ck.	92[5]
Lavonia	1,060	none	3 septic tanks	440	Shoal Ck.	49[5]
			3 septic tanks	620	Poole's Ck.	69[5]
Royston	2,000	none	2 septic tanks	•	South Beaverdam Ck.	100(?)[5]
			3 septic tanks	•	Broad River Basin	-
Toccoa	6,000	none	none	4,200	Eastanolle Ck.	700[5]
		none	none	1,800	Tributary to Toccoa Ck.	300[5]

(continued) Table I. Sources of Waste Discharging into the Savannah River System

Name	Type of Operation	Production(3)	Water use	Employees		Treatment of Domestic Sewage	Disposal of Domestic Sewage	Treatment of Industrial Sewage	Streams receiving Industrial Waste	Estimated #BOD/day (2)
				Total	Max. Shift					
c. Industries in South Carolina										
Ladlassie Mill	card, spin synthetic yarn	75,000 lbs/wk	2,500 gpd	100	40	none	most to city sewer (Anderson)	none	Rocky R.	<20(5)
Gossett Mill	Finish & Bleach cotton goods	300,000 lbs/wk	650,000 gpd	66	26	none	"	none	Rocky R.	670(4)
Toxaway Mill	Spin, weave cotton prints	440,000 yds/wk	10,500 gpd	400	350	none	"	none	Rocky R.	neg.(4)
Riverside Mill	card, spin synthetic yarn	150,000 lbs/wk	9,800 gpd	340	150	none	"	none	Rocky R.	<20(5)
Services, Inc.	Laundry	use/month: 100 lbs. Calgon 500 lbs. Soap 1000 lbs. Alkali 25 lbs. HTH 400 lbs. Starch	15,000 gpd	50		septic tank	"	none	Rocky R.	<50(5)
Wellington Mills	Greige goods weaving	40,000 lbs/wk	150,000 gpd (mill village)	630	250	2 septic tanks	Beaver Ck.	none	Beaver Ck.	203(5)
Owens Corning Fiberglas Company	make fiberglas textile fiber	"	130,000 gpd	875		activated sludge trtmt.plant	Betsy Ck.	activated sludge trtmt.plant	Betsy Ck.	<50(5)
Blair Mills	spin, weave, dye, finish towels	40,000 lbs/day	"	"		none	Cupboard Ck.	none	Cupboard Ck.	650(5)

(continued) Table I. Sources of Waste Discharging into the Savannah River System

Name	Type of Operation	Production[3]	Water use	Employees		Treatment of Domestic Sewage	Disposal of Domestic Sewage	Treatment of Industrial Sewage	Streams receiving Industrial Waste	Estimated #BOD/day (2)
				Total	Max. Shift					
Southside Mills	weave synthetic cloth	200,000 yds/wk	150,000 gal/mo	200		septic tank	disposal field	none	Cemetary Ck.	<20[4]
Haynesworth Plant	weave synthetic goods	•	25,600 gpd	275		•	•	none	Cemetary Ck.	<20[4]
Anderson Mill	cotton Greige goods	1,500,000 yds/wk	•	1240	519	none	Anderson sewers	none	Whitner Ck.	<20[5]
Anderson Fertilizer Company	agricultural fertilizers	use 350 tons 50° sulfuric acid/wk, 650 tons superphosphate/wk.	75,000 gal/wk	35		none	Whitner Ck.	none	Whitner Ck.	<20[4]
Poinsetta Lumber Company	make sewing machines	500 machines/day	46,000 gpd	340	340	Imhoff tank Sand filter	Whitner Ck.	Lagoon (paint waste)	Whitner Ck.	<20[4]
Excelsior Mill	synthetic textiles	12-15 million lbs/yr.	250,000 gpd (incl.village)	402	168	none	Seneca R.	none	Seneca R.	<20[5]
Wright Provision Company	meat processing and packing	•	10,000 gpd	18		2 septic tanks	Hembree Ck.	2 septic tanks	Hembree Ck.	80-160[5]
Pendleton Manufacturing Co.	woolen textiles	50,000 yds/wk + 22,000 lbs/wk	900,000 gpd	•		none	Twenty-three Mile Ck.	none	Twenty-three Mile Ck.	390[4]
Gerrish Milliken Mill	weave synthetic cloth	13,600,000 yds. in 1953	90,000 gpd	•		Imhoff tank, Sand filter	Eighteen-Mile Ck.	Imhoff tank, Sand filter	Eighteen-Mile Ck.	<20[5]

(continued) Table I. Sources of Waste Discharging into the Savannah River System

Name	Type of Operation	Production[3]	Water use	Employees		Treatment of Domestic Sewage	Disposal of Domestic Sewage	Treatment of Industrial Sewage	Stream receiving industrial Waste	Estimated #BOD/day (2)
				Total	Max. Shift					
South Carolina Textiles, Inc.	makes cotton diapers	•	•	25-50		•	Eighteen-mile Ck.	•	Eighteen-mile Ck.	<50[5]
Excelsior Finishing Plant	finish worsteds and synthetics	400,000 yds/wk	2,000,000 gpd	450	225	•	Eighteen-mile Ck.	•	Eighteen-mile Ck.	3650[4]
Central Mills	weave cotton Greige goods	•	13,000 gpd	400	150	none	Central sewers	none	Eighteen-mile Ck.	<50[5]
Oconee Mills	cotton yarn and blankets	•	5,000 gal/mo.	•		none	Westminster sewers, Coneross Ck.	none	Westminster sewers, Coneross Ck.	<50[5]
Kenneth Cotton Mills	cotton sheeting, weave	29,000 lbs/wk	480,000 gal/mo.	175	100	none	Coneross Ck.	none	Coneross Ck.	<20[5]
Utica-Mohawk Mills	cotton sheeting, weave, bleach, dye	600,000 lbs/wk bleached	2,750,000 gpd	•		Imhoff tank	Martin's Ck.	None	Martin's Ck.	16,100[4]
Norris Cotton Mills Company	weave Greige print cloth	300,000 lbs/mo.	•	270	88	none	Twelve-mile Ck.	none	Twelve-mile Ck.	20[5]
Alice Manufacturing Company	weave Greige print cloth	110,000 lbs/wk	•	•		septic tank	Golden Ck.	septic tank	Golden Ck.	<20[5]
Alice Manufacturing Company Arial Plant	weave print cloth	125,000 lbs/wk	•	•		septic tank	Rice Ck.	septic tank	Rice Ck.	<20[5]

(continued) Table I. Sources of Waste Discharging into the Savannah River System

Name	Type of Operation	Production(3)	Water use	Employees		Treatment of Domestic Sewage	Disposal of Domestic Sewage	Treatment of Industrial Sewage	Streams receiving industrial Waste	Estimated #BOD/day (2)
				Total	Max. Shift					
Pickens Mill	cotton sheeting	375,000 yds/wk	65,000 gpd	309	140	4 septic tanks	Town Ck.	4 septic tanks	Town Ck.	<50(5)
Poinsetta Lumber & Manufacturing Company	make plywood cabinets for sewing machines	use/month: 20,000 lbs. Resin Glue 900 gals. paint and varnish	500,000 gal/month	450	450	primary plant	Town Ck.	none	Town Ck.	<20(5)
Julius Kayser Company	makes women's undergarments	•	670,000 gal/month	•		septic tank	Town Ck.	septic tank	Town Ck.	<50(5)
Courtney Mills	cotton cloth	80,000 lbs/wk	•	300	135	none	Little R.	none	Little R.	<50(5)
d. Industries in Georgia										
Coats & Clark Mill No. 1	mercerize and bleach cotton thread	mercerize 19,000 lbs/wk bleach 28,000 lbs/wk	700,000 lbs/wk (waste discharge)	•		none	Toccoa sewer	none	Toccoa sewer, Eastonelle Ck.	<100(5)
Coats & Clark Mill No. 2	mercerize, bleach, dye cotton thread	mercerize, 145,000 lbs/wk. bleach, 55,000 lbs/wk. dye, 68,000 lbs/wk.	5,200,000 gal/wk (waste discharge)	600		none	Eastonolle Ck.	Lagoons	Eastonolle Ck.	1640(4)

(continued) Table I. Sources of Waste Discharging into the Savannah River System

Name	Type of Operation	Production(3)	Water use	Employees		Treatment of Domestic Sewage	Disposal of Domestic Sewage	Treatment of Industrial Sewage	Streams receiving industrial Waste	Estirated #BOD/day (2)
				Total	Max. Shift					
Elberton Mills	weave and dye rayon and cotton	30,000 lbs/wk	3,400,000 gal/ month	375		septic tank	Beaverdam Ck.	none	Beaverdam Ck.	120(5)
Amerton, Hartwell Plant	Slash, quill, weave Greige goods	60,000 lbs/wk	700,000 gal/ month	250		none	Lightwood Log Ck.	none	Lightwood Log Ck.	< 20(5)
Hartwell Mills	card, spin, weave, size cotton sheeting	80,000 lbs/wk	986,000 gal/ month	185		none	Hartwell sewer	none (small amount)	Cedar Ck.	neg.(5)
Lavonia Manufacturing Company	spin, wind, twist cotton yarn	80,000 lbs/wk	15,000 gal/ month	175		none	Lavonia sewer	none (small amount)	Poole's Ck.	neg.(5)
Bartson Mill	quill, weave, warp, bleach, dye cotton, rayon, nylon	18,000 lbs/wk	700,000 gal/ month	117		none	Lavonia sewer	none (small amount)	Poole's Ck.	neg.(5)

(1) Includes only industrial wastes discharged to municipal sewers. Other industries in municipal areas having separate waste outfalls are listed individually.

(2) Pounds 5-day 20°C Biochemical Oxygen Demand.

(3) Quantity of finished product. Information collected by South Carolina Water Pollution Control Authority and U. S. Public Health Service.

(4) Waste load measured by South Carolina Water Pollution Control Authority and/or U. S. Public Health Service. Values given are averages of samples collected.

(5) Waste load estimated on basis of production and/or population.

(*) Undetermined.

Table II. Description of Sampling Station

Number	Location
1.	Savannah River at Calhoun Falls, South Carolina, Hwy. 72
2.	Rocky River one mile west Salem Cemetery, N.W. of Calhoun Falls
3.	Beaverdam Ck., road nearest mouth, one mile west Paris Island
4.	Savannah River near Iva, S.C., S.C.Hwy. 184
5.	Savannah River, S.C.Hwy. 181
6.	Big Generosetee Ck., S.C.Hwy. 187
7.	Savannah River, U. S. Hwy. 29
8.	Lightwood Log Ck., road nearest mouth, one mile N.E. Alfords School
9.	Tugaloo River at Andersonville, S.C., Ferry
10.	Seneca River, S.C. Hwy. 80
11.	Deep Ck., S.C.Hwy. 24
12.	18 Mile Ck., Anderson Co. Hwy. 233
13.	Coneross Ck., Oconee Co. Hwy. 21
14.	Martin Ck., Oconee Co. Hwy. 65
15.	Seneca River, Oconee Hwy. 37 (3 points)
16.	Keowee River, Oconee Hwy. 27
17.	12 Mile Ck., S.C.Hwy. 133
18.	Little River, at Newry, S.C.
19.	Shoal Ck., road nearest mouth, one mile east Shoal Creek Church
20.	Choestoea Ck., Oconee Co. Hwy. 25
21.	Eastonolle Ck., road nearest mouth, 1-1/4 miles north Poplar Springs School
22.	Toccoa Ck., road nearest mouth, 1-1/4 miles N.W.Tugaloo, Georgia

(continued) Table II. Description of Sampling Station

Number	Location
23.	Canoe Ck., S.C.Hwy. 187
24.	Cedar Ck., Ga.Hwy. 181
25.	Rocky River, Anderson Co. Hwy. 263
26.	Generosetee Ck., Anderson Co. Hwy. 47
27.	23 Mile Ck., Anderson Co. Hwy. 189
28.	18 Mile Ck., Anderson Co. Hwy. 56
29.	18 Mile Ck., Anderson Co. Hwy. 229
30.	18 Mile Ck., Pickens Co. Hwy. 43
31.	Tributary to Coneross Ck., about 2 miles S.W. of Seneca, S.C.
32.	Martin Ck., 3/4 mile S.E. of Seneca, S.C., first bridge out of town
33.	Cane Ck., 1/2 mile north of West Union
34.	Seneca River, U.S.Hwy. 76 (3 points)
35.	Eastonolle Ck., below Clark-Coats, Inc., near Toccoa, Georgia
**36.	Anderson, S.C., Whitner Creek Sewage Plant Effluent
**37.	Anderson, S.C., Rocky River Sewage Plant Effluent
**38.	La France-Pendleton Mill Effluent, at La France, S.C.
**39.	Excelsior Finishing Plant (Mill #4) Effluent, at Pendleton, S.C.
**40.	Utica-Mohawk Mills, Clemson Division, Effluent, near Clemson, S.C.
*41.	Drainage ditch carrying sewage from Elberton, Ga., in N.E. edge of town

**/ 2-24 hour composites (approximately hourly portions, proportioned to flow.)

Table III. Tabulation of Laboratory and Field Data

Station Number	Station Description	Date	Temp. (°C)	Rate of Flow(cfs)	Color	pH	Alkalinity (ppm) Methyl Orange	Alkalinity (ppm) Phenolphthalein	Chloride (Cl^-)ppm	Diss. Fe ppm	Diss. Mn ppm	Field Diss. Oxygen (ppm)	Field Diss. Oxygen % Sat.	B.O.D. (ppm)	Coliforms MPN	#B.O.D. Day
1	Savannah R. at Calhoun Falls	11/7	14.0	1,210	15	7.05	17.5	0	-	0.26	-	9.70	93.5	-	230	-
		11/15	14.5	1,260	15	7.7	24.0	0	2.5	0.28	0.11	9.65	94.0	1.5	430	10,200
		11/16	19.0	1,800	21	7.4	20.0	0	1.0	0.34	0.15	9.15	97.8	2.0	2,300	19,400
		11/22	10.5	1,520	22	7.35	24.0	0	3.5	0.36	0.09	10.75	95.8	0.8	4,300	6,540
		11/25	12.0	2,570	23	7.2	20.0	0	1.0	0.38	0.07	10.10	93.2	2.1	46,000	29,000
		11/28	10.5	1,840	38	7.3	18.0	0	2.5	0.50	0.04	10.60	94.5	3.3	24,000	32,700
		11/29	7.0	1,660	-	7.3	17.5	0	3.0	1.06	0.00	12.80	105.2	2.2	2,300	19,600
		12/6	10.0	1,660	20	7.4	18.0	0	2.5	0.30	0.06	10.80	95.3	1.9	7,500	17,000
		12/7	9.0	2,220	42	7.4	20.0	0	3.0	0.56	0.07	12.10	104.5	2.1	4,300	24,000
2	Rocky R. near mouth	11/7	14.5	24	7	7.2	25.5	0	-			9.90	96.5	-	2,300	-
		11/15	19.5	41	8	7.6	40.5	0	2.0			9.05	97.3	1.1	2,400	240
		11/16	18.5	38	17	7.6	26.0	0	1.5			9.25	97.9	1.2	2,300	250
		11/22	9.5	76	19	7.5	26.0	0	3.5			11.05	96.4	0.7	2,300	290
		11/28	10.0	32	24	7.4	25.5	0	3.5			11.60	102.4	2.4	430	410
		11/29	7.0	37	-	7.4	26.5	0	3.5			11.80	97.0	1.7	930	340
		12/6	10.0	54	17	7.55	24.0	0	3.0			10.85	96.0	2.6	430	760
		12/7	8.0	54	16	7.5	23.5	0	3.8			11.55	97.0	2.1	91	610
3	Beaverdam Creek near mouth	11/11	10.0	-	50	7.1	21.0	0	-			11.00	97.1	4.2	24,000	-
		11/15	19.0	22.5	34	7.3	9.5	0	11.0			9.00	96.3	1.5	930	182
		11/17	16.0	23.5	29	7.7	26.5	0	9.5			8.85	88.9	0.6	2,300	76
		11/22	8.0	36	47	7.1	19.0	0	5.5			11.30	95.2	0.8	4,300	155
		11/28	9.0	46	45	7.1	21.5	0	6.0			10.70	92.4	1.2	2,100	297
		11/29	6.0	40	-	7.1	20.5	0	8.0			12.10	97.0	1.6	4,300	344
		12/7	7.0	36	37	7.25	19.0	0	9.0			11.55	94.6	2.2	930	427

(continued)

Table III. Tabulation of Laboratory and Field Data

Station Number	Station Description	Date	Temp. (°C)	Rate of Flow(cfs)	Color	pH	Alkalinity (ppm) Methyl Orange	Alkalinity (ppm) Phenolphthalein	Chloride (Cl^-)ppm	Diss. Fe ppm	Diss. Mn ppm	Field Diss. Oxygen (ppm)	Field Diss. Oxygen % Sat.	B.O.D. (ppm)	Coliforms MPN	*B.O.D. Day
4	Savannah R. at S. C. Highway 184 near Iva, S. C.	11/7	15.0	845	22	7.2	24.5	0	-	0.20	-	10.10	99.5	-	930	-
		11/15	16.5	2,020	24	7.2	20.5	0	2.3	0.30	0.28	9.25	94.0	1.4	750	15,000
		11/16	17.5	2,650	17	7.4	17.5	0	0.0	0.31	0.11	9.00	93.4	0.4	4,300	5,700
		11/22	11.5	1,690	26	6.9	19.5	0	3.0	0.44	0.07	11.05	100.8	1.0	24,000	9,100
		11/23	14.0	1,870	23	7.3	17.5	0	2.0	0.31	0.085	10.45	100.75	1.2	24,000	12,000
		11/28	10.0	1,320	-	7.0	14.5	0	2.5	0.76	0.26	12.90	113.8	2.0	46,000	14,000
		11/29	6.0	2,340	-	7.1	17.5	0	3.0	0.64	0.04	12.20	97.7	1.1	2,300	14,000
		12/6	10.0	1,970	24	7.4	16.5	0	2.8	0.37	0.36	11.10	97.9	1.4	4,300	15,000
		12/7	8.0	2,670	37	7.3	19.0	0	3.4	0.48	0.035	12.10	102.0	1.9	15,000	27,000
5	Savannah R. at S. C. Highway 181	11/7	15.0	1,080	22	7.2	25.5	0	-	0.30	-	9.90	97.5	-	4,300	-
		11/15	15.5	2,370	23	7.4	22.5	0	2.0	0.26	0.26	9.00	89.5	1.7	4,300	22,000
		11/16	16.0	2,570	21	7.3	20.5	0	0.5	0.38	0.18	8.70	87.4	0.4	9,300	5,600
		11/22	12.0	2,300	32	7.0	20.5	0	1.5	0.62	0.03	10.05	92.8	0.8	4,300	9,900
		11/25	11.0	790	38	6.7	16.0	0	2.3	0.82	0.40	10.40	93.8	1.4	110,000	5,900
		11/28	10.0	1,350	-	7.0	14.5	0	2.5	0.66	0.16	10.50	92.6	1.6	15,000	12,000
		11/30	3.0	2,830	-	6.75	14.5	0	2.0	0.40	0.01	12.60	93.5	1.8	9,300	27,000
		12/6	10.0	2,100	32	7.3	17.0	0	2.3	0.76	0.125	11.10	97.9	1.6	24,000	18,000
		12/7	8.0	2,380	28	7.1	16.5	0	1.5	0.38	0.06	11.30	95.1	1.4	4,300	18,000
6	Big Generosetee Creek near mouth	11/8	9.0	32	35	6.0	19.5	0	-			8.05	69.5	3.8	2,300	650
		11/15	15.0	37	42	7.0	37.0	0	6.8			5.70	56.2	6.1	110,000	1,200
		11/16	15.5	32	45	7.1	34.5	0	4.5			5.85	58.2	3.6	24,000	620
		11/22	12.0	32	27	6.7	18.0	0	4.5			9.30	85.9	7.6	110,000	1,300
		11/23	13.5	32	35	6.6	21.5	0	6.5			7.50	71.5	7.4	110,000	1,300
		11/28	11.0	28	-	6.9	27.5	0	4.8			8.65	78.1	2.5	1,500,000	380
		11/30	5.5	27	-	7.15	29.0	0	6.5			11.15	88.2	5.1	430,000	740
		12/6	12.5	30	48	7.2	32.0	0	8.0			8.05	75.1	4.2	43,000	680

Table III. Tabulation of Laboratory and Field Data

(continued)

Station Number	Station Description	Date	Temp. (°C)	Rate of Flow(cfs)	Color	pH	Alkalinity (ppm) Methyl Orange	Alkalinity (ppm) Phenolphthalein	Chloride (Cl^-)ppm	Diss. Fe ppm	Diss. Mn ppm	Field Diss. Oxygen (ppm)	Field Diss. Oxygen % Sat.	B.O.D. (ppm)	Coliforms MPN	*B.O.D. Day
7	Savannah R. at U. S. Highway 29	11/8	10.0	1,770	14	7.1	22.5	0	-	0.28	-	10.05	88.7	2.0	9,300	19,000
		11/14	17.5	810	22	7.4	20.0	0	3.0	0.28	0.04	9.10	94.4	1.4	2,300	6,100
		11/16	18.0	1,910	17	7.4	15.5	0	1.0	0.26	-	9.00	94.3	1.4	4,300	14,000
		11/23	14.0	1,770	10	7.0	12.5	0	2.0	0.14	0.05	10.15	97.9	0.4	430	3,800
		11/25	11.0	1,670	30	7.2	17.5	0	1.0	0.68	0.07	10.25	92.4	4.8	23,000	43,000
		11/28	10.5	1,210	-	7.0	20.5	0	2.0	1.06	0.09	10.60	94.5	1.0	24,000	6,500
		11/30	6.5	2,350	-	7.2	17.0	0	3.0	0.60	0.125	12.10	98.2	1.0	24,000	13,000
		12/6	11.0	1,940	60	7.2	19.0	0	3.8	1.08	0.135	10.60	95.5	1.0	15,000	10,000
8	Lightwood Log Creek near mouth	11/11	13.0	22.5	31	6.8	11.5	0	-			10.20	96.2	1.9	4,300	230
		11/14	18.0	20.5	22	7.0	13.0	0	1.3			8.60	90.2	0.8	430	88
		11/17	15.0	18.	31	7.2	13.5	0	1.5			9.35	92.2	0.9	150	87
		11/23	12.5	22.5	24	7.7	14.0	0	2.5			10.10	94.3	0.6	930	73
		11/25	10.0	28	32	7.0	12.5	0	1.0			10.50	92.7	?	2,300	-
		11/28	10.5	24.	-	6.8	13.5	0	2.4			10.65	95.0	0.9	4,300	116
		11/30	5.0	23	-	6.9	10.5	0	2.5			13.35	104.3	0.6	930	75
		12/6	12.0	24	20	7.0	10.5	0	1.8			10.60	98	0.2	750	26
9	Tugaloo R. at Andersonville Ferry	11/8	12.0	1,450	10	7.1	17.0	0	-	0.16	-	10.55	96.5	0.8	4,300	6,200
		11/14	16.0	300	12	7.3	17.5	0	3.0	0.30	0.16	9.20	92.5	0.9	36	1,500
		11/15	16.0	1,700	10	7.3	13.0	0	1.3	0.12	0.06	9.40	94.4	1.0	9,300	9,200
		11/21	9.0	340	27	7.3	17.5	0	1.8	0.50	0.07	11.10	95.8	0.4	4,300	730
		11/24	14.0	3,100	17	7.0	13.0	0	1.0	0.30	0.07	10.10	97.4	0.4	9,300	6,700
		11/29	7.5	1,550	-	6.7	13.5	0	1.5	0.24	0.01	12.30	102.4	0.6	4,300	5,000
		11/30	6.0	1,900	-	7.0	10.0	0	2.0	0.20	-	12.15	97.3	0.6	9,300	6,100
		12/5	12.0	390	19	7.3	17.0	0	1.5	0.26	0.035	11.15	100	0.8	2,300	1,700

(continued)

Table III. Tabulation of Laboratory and Field Data

Station Number	Station Description	Date	Temp. (°C)	Rate of Flow (cfs)	Color	pH	Alkalinity (ppm) Methyl Orange	Alkalinity (ppm) Phenolphthalein	Chloride (Cl^-) ppm	Diss. Fe ppm	Diss. Mn ppm	Field Diss. Oxygen (ppm)	Field Diss. Oxygen % Sat.	B.O.D. (ppm)	Coliforms MPN	#B.O.D. Day
10	Seneca River at S. C. Highway 80	11/8	11.0	477	25	7.2	25.0	0	-	0.34	-	9.60	86.6	1.4	7,500	3,600
		11/14	14.5	477	38	7.3	22.5	0	3.2	0.56	0.10	9.05	88.2	3.1	24,000	8,000
		11/15	16.0	568	30	7.3	24.5	0	2.3	0.40	0.16	8.65	86.9	1.6	9,300	4,900
		11/21	9.5	607	40	7.3	22.0	0	1.5	0.72	0.14	9.95	86.8	0.8	46,000	2,600
		11/24	11.5	788	38	7.3	20.0	0	1.5	0.48	0.125	8.95	81.6	3.2	110,000	14,000
		11/29	9.0	699	-	8.1	20.5	0	2.0	0.64	0.025	12.30	106.1	1.8	4,300	6,800
		11/30	4.0	568	-	7.15	21.5	0	3.0	0.66	0.07	11.20	85.3	2.0	15,000	6,100
		12/5	10.0	726	44	7.4	18.5	0	3.5	0.48	0.10	10.35	91.5	0.4	> 110,000	1,600
11	Deep Creek near mouth	11/8	10.5	43	28	7.0	20.5	0	-			10.35	92.3	1.4	930	320
		11/14	14.5	49	45	7.2	19.5	0	8.3			9.40	91.6	1.5	4,300	400
		11/15	17.5	50	36	7.3	21.0	0	22.5			8.60	89.2	1.0	9,300	270
		11/21	10.0	59	47	7.3	20.0	0	20.0			11.15	98.4	1.8	9,300	570
		11/23	12.0	52	47	7.1	21.5	0	23.5			9.90	91.4	> 8.6	46,000	>2,400
		11/29	3.0	59	-	6.95	18.5	0	12.5			9.60	71.2	3.3	46,000	1,000
		11/30	3.0	55	-	7.1	22.0	0	20.5			12.90	95.7	2.6	9,300	770
		12/5	10.0	85	250	7.3	18.0	0	4.0			10.30	91	1.6	110,000	730
		12/6	10.0	49	155	7.05	15.5	0	12.5			11.10	98.2	1.2	7,500	320
12	Eighteen-Mile Creek near mouth	11/8	12.5	18	15	6.8	18.0	0	-			9.25	86.3	9.3	> 110,000	900
		11/14	15.0	22	43	7.2	25.0	0	5.0			8.50	83.8	4.1	110,000	490
		11/15	19.0	21	48	7.3	35.5	0	2.0			6.65	71.1	8.9	46,000	1,000
		11/21	12.0	23	35	7.1	26.0	0	1.5			9.60	88.7	7.9	43,000	980
		11/25	10.0	40	90	7.1	28.0	0	37.0			8.40	74.2	5.2	4,600,000	1,100
		11/29	3.0	32	-	6.9	25.5	0	2.0			-	-	10.0	210,000	1,700
		11/30	3.0	26	-	6.9	23.5	0	11.0			13.10	97.1	4.6	230,000	640
		12/6	11.0	36	45	7.1	22.0	0	5.8			9.50	85.5	3.0	930,000	580
		12/7	9.0	29	43	7.1	26.0	0	4.0			10.10	87.0	9.9	11,000,000	1,500

(continued)

Table III. Tabulation of Laboratory and Field Data

Station Number	Station Description	Date	Temp. (°C)	Rate of Flow(cfs)	Color	pH	Alkalinity (ppm) Methyl Orange	Alkalinity (ppm) Phenolphthalein	Chloride (Cl^-)ppm	Diss. Fe ppm	Diss. Mn ppm	Field Diss. Oxygen (ppm)	Field Diss. Oxygen % Sat.	B.O.D. (ppm)	Coliforms MPN	%B.O.D. Day
13	Coneross	11/8	11.0	17	21	6.9	23.0	0	-			10.10	99.3	1.5	750	140
	Creek	11/14	15.0	25	28	7.25	22.5	0	3.8			9.25	91.1	1.0	9,300	130
	near	11/15	17.5	29	25	7.5	26.5	0	1.0			8.75	90.7	0.8	2,100	120
	mouth	11/21	7.0	28	68	7.4	23.5	0	1.3			11.00	90.4	2.0	>110,000	300
		11/23	12.0	20	33	7.0	23.0	0	2.0			10.40	96.0	1.9	4,300	200
		11/28	9.0	42	-	7.4	20.0	0	2.5			10.60	91.4	2.6	23,000	590
		11/29	4.0	26	-	7.0	20.0	0	2.5			-	-	3.0	15,000	420
		12/5	10.5	40	160	7.2	18.5	0	3.0			10.20	91.0	2.2	15,000	470
		12/6	10.0	32	43	7.15	20.0	0	2.0			10.40	92.0	1.0	3,600	170
14	Martin	11/10	17.5	11.0	670	11.8	1,350	865	-			1.10	11.41	507	150	30,000
	Creek	11/14	25.0	9.5	480	11.8	1,185	835	-			0.00	0.00	515	210	26,000
	near	11/15	25.5	9.0	430	11.8	1,250	805	32.0			2.00	24.10	442	36	21,000
	mouth	11/21	15.0	9.0	340	11.7	1,195	855	23.8			2.40	23.65	452	36	22,000
		11/23	13.0	17.0	200	11.1	285	80	9.0			5.70	43.83	126	>110,000	12,000
		11/28	9.0	10.5	-	10.9	145	40	6.0			8.10	69.90	140	23,000	7,900
		11/29	13.0	10.5	-	12.1	1,830	1,290	47.5			-	-	610	0	34,000
		12/5	10.0	18.5	170	11.6	360.0	210.0	12.5			4.40	39.0	160	3,600	16,000
		12/6	10.0	13.5	180	11.7	1,060	900	13.5			4.35	38.5	195	0	14,000
														Ave. 350		
15	Seneca R.	11/8	12.0	361	22	6.8	16.5	0	-			10.10	93.2	1.6	Composite	3,100
	below 11/11	Composite		450	24	7.0		0	-			Composite		-		-
	Clemson 11/14			368	34	8.1	20.5	0	0.0					2.8	Sample	5,600
	11/15	Sample of		313	25	7.3	16.0	0	0.0			Sample of		1.5	of	2,500
	11/22			330	33	7.1	15.5	0	1.0					2.2		3,900
	11/24	1/3 15L,		580	36	6.95	15.0	0	1.0			1/3 15L		1.3	1/3 15L	4,100
	11/28			441	43	6.8	13.5	0	1.5					2.2		5,200
	11/29	1/3 15M,		410	-	7.15	15.0	0	1.0			1/3 15M		1.1	1/3 15M	2,400
	12/5			471	28	7.0	21.0	0	1.0					2.1		5,300
	12/6	1/3 15R		481	28	6.3	15.0	0	0.0			1/3 15R		1.0	1/3 15R	2,600

(continued)

Table III. Tabulation of Laboratory and Field Data

Station Number	Station Description	Date	Temp. (°C)	Rate of Flow(cfs)	Color	pH	Alkalinity (ppm) Methyl Orange	Alkalinity (ppm) Phenolphthalein	Chloride (Cl^-)ppm	Diss. Fe ppm	Diss. Mn ppm	Field Diss. Oxygen (ppm)	Field Diss. Oxygen %Sat.	B.O.D. (ppm)	Coliforms (MPN	B.O.D. Day
15 L	Seneca R.	11/11	10.0		-	-	-	-	-			10.15	89.6	-	110,000	
	below	11/14	14.0		-	-	-	-	-			9.55	92.1	-	>110,000	
	Clemson	11/15	17.0		-	-	-	-	-			9.10	93.4	-	46,000	
	near	11/22	8.5		-	-	-	-	-			10.75	91.6	-	240,000	
	Left Bank	11/24	-		-	-	-	-	-			-	-	-	-	
		11/28	8.0		-	-	-	-	-			10.80	91.0	-	93,000	
		11/29	7.0		-	-	-	-	-			11.80	97.0	-	24,000	
		12/5	8.0		-	-	-	-	-			11.00	92.6	-	240,000	
		12/6	9.0		-	-	-	-	-			10.80	93.2	-	-	
15 M	Seneca R.	11/11	10.0		-	-	-	-	-			10.30	90.8	-	110,000	
	below	11/14	14.0		-	-	-	-	-			9.45	91.1	-	>110,000	
	Clemson	11/15	16.5		-	-	-	-	-			9.00	91.4	-	110,000	
		11/22	8.0		-	-	-	-	-			11.00	92.7	-	150,000	
	Midstream	11/24	10.0		-	-	-	-	-			10.45	92.2	-	15,000	
		11/28	8.0		-	-	-	-	-			10.90	91.8	-	240,000	
		11/29	6.0		-	-	-	-	-			11.90	95.3	-	46,000	
		12/5	8.0		-	-	-	-	-			11.00	92.6	-	240,000	
		12/6	9.0		-	-	-	-	-			10.70	92.4	-	1,100,000	
15 R	Seneca R.	11/11	10.0		-	-	-	-	-			10.40	91.8	-	110,000	
	below	11/14	14.0		-	-	-	-	-			9.50	91.6	-	110,000	
	Clemson	11/15	16.0		-	-	-	-	-			9.15	92.0	-	46,000	
	near	11/22	8.0		-	-	-	-	-			10.85	91.4	-	93,000	
	Right	11/24	10.0		-	-	-	-	-			10.35	91.3	-	43,000	
	Bank	11/28	8.0		-	-	-	-	-			10.90	91.8	-	93,000	
		11/29	7.0		-	-	-	-	-			11.90	97.8	-	110,000	
		12/5	8.0		-	-	-	-	-			11.80	99.5	-	93,000	
		12/6	9.0		-	-	-	-	-			10.70	92.3	-	240,000	

(continued)

Table III. Tabulation of Laboratory and Field Data

Station Number	Station Description	Date	Temp. (°C)	Rate of Flow(cfs)	Color	pH	Alkalinity (ppm) Methyl Orange	Alkalinity (ppm) Phenolphthalein	Chloride (Cl^-)ppm	Diss. Fe ppm	Diss. Mn ppm	Field Diss. Oxygen (ppm)	Field Diss. Oxygen % Sat.	B.O.D. (ppm)	Coliforms MPN	#B.O.D. Day
16	Keowee R.	11/9	10.0	278	25	7.0	17.0	0	-			10.35	91.3	1.8	9,390	2,700
	Oconee	11/11	9.0	518	27	7.3	7.0	0	-			10.55	91.0	1.8	9,300	5,000
	Hwy. 27	11/14	14.0	310	26	7.3	15.0	0	1.3			9.50	91.6	1.0	24,000	1,700
	near	11/16	15.5	310	27	7.1	15.0	0	0.5			9.00	89.5	1.0	9,300	1,700
	Newry	11/21	11.0	310	28	7.1	15.5	0	0			10.40	93.8	1.0	7,500	1,700
		11/24	11.0	598	45	7.2	13.5	0	0.5			10.60	95.6	1.4	9,300	4,500
		11/29	4.0	376	-	6.6	16.5	0	1.5			10.60	80.7	1.2	4,300	2,400
		11/30	3.5	333	-	7.0	14.0	0	1.5			12.80	96.2	1.1	21,000	2,000
		12/5	10.0	458	15	7.2	10.0	0	1.0			11.20	98.9	0.8	430	2,000
		12/6	10.0	389												
17	Twelve-mile	11/9	10.5	80	25	7.3	18.5	0	-			10.40	92.8	2.1	24,000	900
	Creek at	11/14	14.5	103	35	7.3	16.0	0	2.5			9.50	92.5	1.6	24,000	890
	S. C.	11/16	15.5	46	21	7.0	19.5	0	1.0			8.90	88.6	1.0	4,300	250
	Hwy. 133	11/21	11.0	94	45	7.25	16.5	0	0			10.20	92.0	1.2	9,300	610
		11/23	10.0	112	29	7.5	18.0	0	2.0			10.35	91.3	1.4	110,000	840
		11/29	5.0	88	-	6.7	16.5	0	3.0			11.30	88.2	1.6	15,000	760
		11/30	5.0	91	-	7.0	16.0	0	2.5			13.00	101.6	1.3	24,000	640
		12/5	10.0	111	33	7.1	16.0	0	2.5			11.05	97.5	2.0	46,000	1,200
		12/6	8.0	91	47	7.0	18.5	0	1.0			10.70	90.0	-	46,000	-
18	Little R.	11/10	7.5	79	37	7.2	19.0	0	-			9.90	82.4	4.4	24,000	1,900
	at Newry	11/14	14.0	70	32	7.3	17.0	0	1.2			9.10	87.8	1.2	110,000	450
		11/16	15.5	77	33	7.0	18.0	0	0			9.00	89.5	1.9	46,000	790
		11/21	9.0	81	45	7.1	17.5	0	0			10.00	86.3	2.0	75,000	870
		11/24	11.0	150	48	6.75	17.5	0	1.5			10.50	94.8	3.5	43,000	2,800
		11/29	5.0	119	-	6.55	17.5	0	2.5			9.20	72.0	2.6	43,000	1,700
		11/30	4.0	105	-	6.95	17.0	0	2.5			12.00	91.4	1.8	23,000	1,000
		12/5	9.0	81	25	7.0	15.0	0	1.5			10.40	89.7	3.6	460,000	1,600
		12/6	9.0	98	33	7.05	17.5	0	1.5			10.20	88.0	2.4	43,000	1,300

(continued)

Table III. Tabulation of Laboratory and Field Data

Station Number	Station Description	Date	Temp. (°C)	Rate of Flow(cfs)	Color	pH	Alkalinity (ppm) Methyl Orange	Alkalinity (ppm) Phenolphthalein	Chloride (Cl^-)ppm	Diss. Fe ppm	Diss. Mn ppm	Field Diss. Oxygen (ppm)	Field Diss. Oxygen % Sat.	B.O.D. (ppm)	Coliforms MPN	%S.O.D. Day
19	Shoal Creek	11/11	14.5	> 12.3	33	7.2	19.0	0	-			10.05	97.9	1.6	930	> 110
	near	11/14	19.5	> 12.3	30	8.1	22.0	0	2.0			9.50	102.6	1.2	2,400	> 79
	mouth	11/17	11.5	> 12.3	34	7.3	22.0	0	3.0			10.00	91.3	1.6	930	> 110
		11/21	15.0	12.3	19	7.3	20.0	0	2.0			10.15	100.0	1.4	2,300	93
		11/24	17.0	12.3	29	7.4	19.0	0	3.5			9.90	101.6	0.6	9,300	40
		11/29	6.0	<12.3	-	7.0	18.5	0	4.0			12.90	103.4	0.6	4,300	< 40
		11/30	3.5	<12.3	-	7.3	18.0	0	4.5			13.40	100.8	0.5	2,300	< 33
		12/5	13.0	<12.3	39	7.45	19.0	0	3.5			10.80	102	0.4	4,300	< 26
20	Chestoea	11/9	7.5	10.0	18	7.4	25.0	0	-			11.00	90.4	3.5	930	190
	Creek	11/10	8.0	11.0	21	7.2	23.0	0	-			10.50	88.4	4.5	930	270
	near	11/14	14.5	11.5	24	7.4	25.0	0	2.0			9.25	90.2	2.1	930	130
	mouth	11/17	12.0	11.0	26	7.3	26.5	0	1.5			9.50	87.8	1.4	930	83
		11/21	8.5	12.0	20	7.3	24.0	0	1.0			11.40	97.2	0.4	3,900	26
	Oconee	11/24	13.0	17.5	60	7.2	22.0	0	2.0			9.65	91.0	0.6	4,300	57
	Hwy. 25	11/28	7.0	15.0	-	7.1	25.5	0	2.0			11.15	91.6	1.2	15,000	97
		11/29	3.0	14.0	-	7.0	23.0	0	2.0			12.80	94.8	0.5	9,300	38
		12/5	9.0	15.5	105	7.3	23.0	0	1.0			10.55	91.0	0.4	2,300	33
		12/6	9.5	14.0	40	7.25	23.0	0	1.5			10.35	90.3	0.4	4,300	30
21	Eastonolle	11/11	11.5	19	110	7.9	99.0	0	-			7.10	64.8	6.2	9,300	634
	Creek	11/14	17.5	17.5	45	7.8	75.0	0	12.5			6.40	66.3	2.2	1,500	207
	near	11/17	12.0	19	65	7.6	93.5	0	21.5			6.65	61.4	2.7	150	276
	mouth	11/21	11.5	12	43	7.5	63.0	0	12.5			8.90	81.2	2.9	9,300	187
		11/24	14.5	29	130	7.6	66.5	0	12.0			7.25	70.7	5.4	46,000	843
		11/28	8.0	22.5	-	7.4	63.0	0	9.5			9.55	80.5	2.3	24,000	279
		11/29	4.0	22	-	7.35	61.5	0	14.5			11.25	85.6	4.5	110,000	530
		12/5	10.5	29	150	7.6	51.5	0	8.75			8.70	77.7	3.5	110,000	546
		12/6	11.0	26.5	75	7.5	61.5	0	16.5			8.10	73.0	3.2	110,000	456

(continued)

Table III. Tabulation of Laboratory and Field Data

Station Number	Station Description	Date	Temp. (°C)	Rate of Flow(cfs)	Color	pH	Alkalinity (ppm) Methyl Orange	Alkalinity (ppm) Phenolphthalein	Chloride (Cl^-)ppm	Diss. Fe ppm	Diss. Mn ppm	Field Diss. Oxygen (ppm)	Field Diss. Oxygen % Sat.	B.O.D. (ppm)	Coliforms MPN	*B.O.D. Day
22	Toccoa	11/10	9.0	14.5	32	7.0	23.0	0	-			-	-	3.6	110,000	281
	Creek	11/14	15.0	9.8	20	7.4	24.0	0	3.5			8.65	85.2	0.8	24,000	42
	near	11/17	13.0	8.9	28	6.6	28.0	0	3.5			8.80	83.0	0.7	24,000	34
	mouth	11/21	9.0	11.5	25	7.2	21.0	0	3.5			11.10	95.8	0.8	110,000	50
		11/24	13.0	15.0	43	7.1	18.5	0	3.0			9.60	90.6	0.8	> 110,000	65
		11/28	7.0	9.8	-	7.05	25.5	0	3.0			10.90	89.6	0.8	24,000	42
		11/29	2.5	11.5	-	6.9	21.5	0	4.0			12.70	93.0	1.0	> 110,000	62
		12/5	9.0	12.5	40	7.2	22.0	0	2.5			10.35	89.2	2.6	24,000	175
		12/6	9.0	12.0	24	7.2	20.0	0	3.0			10.60	91.4	0.4	24,000	26
23	Canoe	11/10	9.0	26.5	65	7.75	23.0	0	-			10.25	88.4	7.0	4,300	1,000
	Creek	11/15	15.0	10.5	26	7.3	20.5	0	2.5			9.45	93.1	1.5	9,300	85
	near	11/16	16.0	10.0	34	7.5	21.5	0	1.5			9.30	93.4	0.9	4,300	48
	mouth	11/22	11.0	15.0	26	7.1	18.5	0	2.8			10.95	98.8	0.5	2,300	40
		11/23	14.0	17.0	27	7.1	19.5	0	2.5			9.80	94.5	1.2	2,300	110
	Ga. Hwy.	11/28	11.0	15.5	-	7.0	16.5	0	2.0			11.00	99.3	1.3	930	110
	181	11/29	5.0	13.5	-	6.9	19.5	0	3.0			12.05	94.2	2.2	430	160
		12/6	10.0	12.5	32	7.3	17.0	0	2.3			11.10	98.1	0.8	430	54
		12/7	8.0	13.0	sample bottle broken							11.90	100		930	-
24	Cedar	11/11	11.0	12.8	15	4.3 ?	0 ?		0	-		9.40	84.8	0 ?	9,300	-
	Creek	11/15	19.0	10.5	43	6.7	10.5		0	1.5		7.95	85.0	1.9	4,300	107
	near	11/17	15.0	10.3	47	6.9	11.5		0	2.5		8.65	85.2	0.7	2,300	39
	mouth	11/23	14.0	11.5	34	6.8	12.0		0	3.0		9.40	90.7	0.7	750	43
	at Ga.	11/25	11.0	14.2	43	6.8	12.5		0	2.5		11.10	100.2	1.0	4,300	76
	Hwy. 181	11/28	9.0	13.4	-	4.8	4.5 ?		0	2.0		10.00	86.3	1.3	4,300	94
		11/30	3.0	12	-	6.2	9.0 ?		0	3.0		12.40	91.9	2.8	4,300	181
		12/6	11.0	12.3	40	7.1	14.0		0	3.5		10.00	88.4	1.9	9,300	126
		12/7	8.0	12	38	6.8	13.0		0	3.5		11.20	94.0	2.2	2,300	142

(continued)

Table III. Tabulation of Laboratory and Field Data

Station Number	Station Description	Date	Temp. (°C)	Rate of Flow(cfs)	Color	pH	Alkalinity (ppm) Methyl Orange	Alkalinity (ppm) Phenolphthalein	Chloride (Cl^-)ppm	Diss. Fe ppm	Diss. Mn ppm	Field Diss. Oxygen (ppm)	Field Diss. Oxygen % Sat.	B.O.D. (ppm)	Coliforms MPN	#B.O.D. Day
25	Rocky R.	11/18AM	8.5	14.5	41	7.3	40.0	0	5.0			6.00	51.2	6.1	> 110,000	480
	Anderson	11/18PM	12.0	10.0	43	7.1	54.0	0	8.5			3.35	30.9	11.6	> 110,000	620
	Co. Hwy.	11/22	12.0	14.5	43	6.9	47.0	0	6.0			3.65	33.7	26.4	2,400,000	2,100
	near	11/25	11.0	31.0	47	7.0	31.0	0	4.0			6.45	58.2	7.5	230,000	1,300
	Greenville															
26	Generosetee	11/18AM	10.5	2.5	20	7.2	46.5	0	9.8			8.75	78.0	1.4	24,000	19
	Creek	11/18PM	14.0	3.0	18	7.3	50.0	0	33.5			7.85	75.7	2.6	110,000	42
	Anderson	11/22	13.0	3.0	27	6.55	27.5	0	10.0			8.85	83.5	3.6	15,000	58
	Co. Hwy.47	11/25	11.0	17.0	110	6.8	28.5	0	4.5			8.45	76.3	8.7	460,000	800
27	Twenty-three	11/18	13.0	27	43	7.0	19.5	0	24.5			8.15	76.9	4.1	> 110,000	600
	Mile Creek	11/22	10.0	37	60	7.1	20.0	0	34.5			9.55	84.3	4.7	120,000	940
	at Anderson	11/24	12.0	78	125	6.7	17.0	0	5.0			10.10	93.2	2.0	93,000	840
	Co. Hwy.189															
	24-Hour Composite Sample:															
27	Twenty-three	12/1	-	36	-	7.40	18.0	0	49.0			* 13.20	-	4.50		870
	Mile Creek	12/9	-	50	-	7.3	19.0	0	26.5			* 8.65		2.4		650
	at Anderson															
	Co. Hwy.189															
	24-Hour Composite Sample:															
27A	Twenty-three	12/1	-	36	-	7.35	21.0	0	16.0			* 8.75	-	0.7		140
(38)	Mile Creek	12/9	-	50	-	7.45	16.5	0	13.5			* 9.55		2.2		600
	above															
	La France															

(continued)

Table III. Tabulation of Laboratory and Field Data

Station Number	Station Description	Date	Temp. (°C)	Rate of Flow(cfs)	Color	pH	Alkalinity (ppm) Methyl Orange	Alkalinity (ppm) Phenolphthalein	Chloride (Cl^-)ppm	Diss. Fe ppm	Diss. Mn ppm	Field Diss. Oxygen (ppm)	Field Diss. Oxygen % Sat.	B.O.D. (ppm)	Coliforms MPN	%B.O.D. Day
28	Eighteen-Mile Creek at Anderson Co. Hwy. 56	11/18	13.0	18.0	42	7.0	32.0	0	15.0			7.10	67.0	36.4	> 110,000	3,500
		11/21	13.0	20.0	34	6.5	15.5	0	1.0			8.50	80.2	7.7	93,000	830
		11/23	12.0	34.0	105	7.1	20.5	0	3.0			8.40	77.5	> 8.4	1,500,000	> 1,500
29	Eighteen-Mile Creek at Pickens Co. Hwy.229	11/18	12.0	16.5	24	7.25	26.5	0	4.0			9.50	87.7	1.9	4,300	170
		11/21	12.0	18.5	29	7.0	23.5	0	2.0			10.00	92.3	2.4	4,300	240
		11/23	11.0	25.5	75	7.1	18.5	0	3.5			8.90	80.4	2.4	46,000	330
30	Eighteen-Mile Creek at Pickens Co.Hwy. 43	11/18	6.0	5.7	38	7.1	46.5	0	5.0			9.25	74.1	2.3	110,000	71
		11/22	5.5	6.5	40	7.1	36.0	0	6.0			9.55	75.6	6.4	43,000	220
		11/24	15.0	9.4	75	7.0	29.0	0	5.0			7.90	77.8	3.8	43,000	190
31	Tributary of Generosetee Creek near Seneca	11/17	13.0	2.1	33	7.0	20.0	0	2.0			9.10	85.8	2.4	-	27
		11/18	10.0	2.0	23	6.9	18.5	0	2.0			10.00	88.3	1.2	4,300	13
		11/21	8.0	2.1	27	6.9	17.5	0	0.0			10.50	88.4	1.8	4,300	20
		11/23	12.0	2.1	25	6.9	17.5	0	1.5			9.50	87.7	1.4	4,300	16
32	Martin Creek near Seneca	11/17	14.0	0.9	20	7.0	19.0	0	4.0			8.65	83.4	1.8	36,000	9
		11/18	11.0	0.9	12	6.7	18.0	0	4.0			9.80	88.4	1.6	1,500	8
		11/21	10.0	0.9	12	6.9	18.0	0	1.3			10.60	93.6	0.9	9,300	4
		11/23	13.0	0.9	23	7.3	17.5	0	2.0			8.85	83.5	3.0	15,000	15
33	Cane Creek near West Union	11/17	14.5	7.5	38	7.1	21.0	0	2.5			8.25	80.4	3.8	460,000	150
		11/18	8.0	7.5	36	7.0	18.0	0	1.5			9.90	83.4	1.2	46,000	48
		11/21	7.0	7.5	31	7.0	19.0	0	0			9.40	77.2	1.5	93,000	61
		11/23	11.0	7.5	28	7.0	18.5	0	2.0			8.90	80.3	0.6	43,000	24

(continued)

Table III. Tabulation of Laboratory and Field Data

Station Number	Station Description	Date	Temp. (°C)	Rate of Flow(cfs)	Color	pH	Alkalinity (ppm) Methyl Orange	Alkalinity (ppm) Phenolph-thalein	Chloride (Cl^-)ppm	Diss. Fe ppm	Diss. Mn ppm	Field Disc. Oxygen (ppm)	Field Disc. Oxygen % Sat.	B.O.D. (ppm)	Coliforms MPN	#B.O.D. Day
34	Seneca River	11/11	-	450	23	7.0	-	0	-			-	-	-	-	-
	U.S.Hwy. 76	11/15	-	313	24	7.2	15.0	0	1.0			-	-	1.2	-	
	above	11/16	-		26	7.0	15.0	0	0			-	-	0.8	-	
	Clemson.	11/22	-	330	30	7.0	13.5	0	1.0			-	-	1.3	-	
		11/24	-	580	42	7.0	14.5	0	1.0			-	-	1.0	-	
	Sample	11/28	-	441	36	6.5	9.0	0	2.5			-	-	1.9	-	
	Composite of	11/29	-	410	-	7.7	17.0	0	1.5			-	-	3.4	-	
	34L,34M,34R	12/5	-	471	26	6.95	13.0	0	1.0			-	-	1.8	-	
		12/6	-	481	26	7.1	14.0	0	0.7			-	-	0.8	-	
34L	Seneca River	11/11	9.0		-	-	14.0	0	-			10.55	91.0	1.2	4,300	
	U.S.Hwy. 76	11/15	16.5		-	-	-	-	-			9.40	95.5	-	2,400	
	above	11/16	14.0		-	-	-	-	-			9.15	88.3	-	9,300	
	Clemson	11/22	7.0		-	-	-	-	-			10.90	89.6	-	9,300	
		11/24	10.0		-	-	-	-	-			10.10	89.2	-	9,300	
	Near Left	11/28	8.0		-	-	-	-	-			10.85	91.4	-	24,000	
	Bank	11/29	7.0		-	-	-	-	-			11.80	96.9	-	4,300	
		12/5	8.0		-	-	-	-	-			11.10	93.5	-	7,500	
		12/6	8.0		-	-	-	-	-			10.80	91.0	-	24,000	
34M	Seneca River	11/11	9.0		-	-	16.5	0	-			10.65	91.8	1.3	24,000	
	U.S.HWy. 76	11/15	16.0		-	-	-	-	-			9.25	93.0	-	2,400	
	above	11/16	14.0		-	-	-	-	-			9.25	89.2	-	2,400	
	Clemson	11/22	7.0		-	-	-	-	-			10.85	89.2	-	4,300	
		11/24	10.0		-	-	-	-	-			10.45	92.2	-	9,300	
	Midstream	11/28	8.0		-	-	-	-	-			10.80	91.0	-	4,300	
		11/29	7.0		-	-	-	-	-			11.90	97.8	-	24,000	
		12/5	8.0		-	-	-	-	-			11.30	95.2	-	930	
		12/6	9.0		-	-	-	-	-			10.60	91.5	-	2,400	

(continued)

Table III. Tabulation of Laboratory and Field Data

Station Number	Station Description	Date	Temp. (°C)	Rate of Flow(cfs)	Color	pH	Alkalinity (ppm) Methyl Orange	Alkalinity (ppm) Phenolphthalein	Chloride (Cl^-)ppm	Diss. Fe ppm	Diss. Mn ppm	Field Diss. Oxygen (ppm)	Field Diss. Oxygen % Sat.	B.O.D. (ppm)	Coliforms MPN	#B.O.D. Day
34R	Seneca River	11/11	8.5		-	-	16.5	0	-			10.55	89.9	1.1	24,000	
	U.S.Hwy. 76	11/15	16.5		-	-	-	-	-			9.35	94.9	-	930	
	above	11/16	14.0		-	-	-	-	-			9.40	90.7	-	24,000	
	Clemson	11/22	7.0		-	-	-	-	-			11.00	90.4	-	9,300	
		11/24	9.0		-	-	-	-	-			10.10	87.1	-	46,000	
	Near Right	11/28	8.0		-	-	-	-	-			10.70	90.2	-	9,300	
	Bank	11/29	7.0		-	-	-	-	-			11.90	97.8	-	2,300	
		12/5	8.0		-	-	-	-	-			11.60	90.1	-	2,300	
		12/6	8.0		-	-	-	-	-			10.80	91.0	-	2,400	
35	Eastonolle	11/10			150	10.8	180	102	-				-	27.0	-	
	Creek below	11/14	20.5	3.9	150	10.4	265	100	75.0			0.00	0.00	84.0	>110,000	1,800
	Coats &	11/17	17.0	3.0	90	10.7	275	150	81.5			0.00	0.00	64.0	240,000	1,000
	Clark,below	11/21	16.5	3.9	125	10.1	265	55.0	67			0.00	0.00	53.0	≥11,000,000	1,100
	Toccoa	11/24	17.5	3.9	75	10.1	161	62	35.0			1.35	14.00	79.0	2,300,000	1,700
		11/28	12.0	4.3	-	10.2	366	250	84.5			0.65	6.00	54.0	4,600,000	1,300
		11/29	9.0	3.9	-	10.55	165	76.5	66.0			2.65	22.88	?	4,600,000	-
		12/5	14.0	4.9	80	10.05	142.0	60	66.0			2.30		54.0	4,600,000	1,400
		12/6	16.0	5.3	100	10.3	200.0	90.0	75.5			0.00		111.0	11,000,000	3,200
24-HOUR COMPOSITE SAMPLE:																
36	Whitner Ck.	12/2	-		-	-	-	-	-			*-	-	291		3,500
	Sewage Treat-	12/8	-		-	-	-	-	-			-	-	297		3,900
	ment Plant, Anderson,S.C. effluent															
24-HOUR COMPOSITE SAMPLE:																
37	Rocky River	12/2	-		-	-	-	-	-			*-	-	156		2,600
	Sewage Treat-	12/8	-		-	-	-	-	-			-	-	176		1,500
	ment Plant, Anderson,S.C. effluent															
38(Refer to 27A)																

(continued)

Table III. Tabulation of Laboratory and Field Data

Station Number	Station Description	Date	Temp. (°C)	Rate of Flow(cfs)	Color	pH	Alkalinity (ppm) Methyl Orange	Alkalinity (ppm) Phenolphthalein	Chloride (Cl^-)ppm	Diss. Fe ppm	Diss. Mn ppm	Field Diss. Oxygen (ppm)	Field Diss. Oxygen % Sat.	B.O.D. (ppm)	Coliforms MPN	#B.O.D. Day
24-HOUR COMPOSITE SAMPLE:																
39	Waste Ditch from Excelsior Finishing Plant	12/1	-	2.84	-	7.90	68.0	0	0.0			* 12.50	-	294		4,500
		12/9	-	2.46	-	6.9	23.0	0	12.5			-	-	210		2,800
24-HOUR COMPOSITE SAMPLE:																
40	Waste Ditch from Utica-Mohawk Plant	12/1	-	2.52	-	12.3	2,705	2,195	160			* 0.00	-	1,060		14,400
		12/9	-	3.49	-	13.0	2,925	2,545	50.0			-	-	940		17,800
41	Ditch below Elberton,Ga.	11/15	19.0	0.56	-	7.0	125.0	0	-			-	-	228	-	687
		11/17	17.0	0.56	-	7.1	87.0	0	-			-	-	75.0	-	226
		11/22	15.0	0.56	-	7.3	131.0	0	-			-	-	200	-	602
	Raw sewage	11/23	17.0	0.56	-	7.05	92.0	0	-			-	-	152	-	458

* Initial Dissolved Oxygen, not taken in Field

Table IV. Water Quality - Savannah River

Averages of Individual Results

Station	1	4	5	7
Discharge (cfs)	1,750	1,750	1,970	1,680
Color	24	25	28	26
pH	7.3	7.2	7.1	7.2
Alkalinity(M.O.)(ppm)	19.9	18.5	18.6	18.1
Chlorides (ppm)	2.4	2.4	1.8	2.3
Fe (ppm)	0.45	0.42	0.51	0.55
Mn (ppm)	0.07	0.16	0.12	0.09
D.O. (ppm)	10.63	10.91	10.39	10.22
D.O. (% Sat.)	97.1	99.3	93.3	94.5
B.O.D.(ppm)(5 day,20°C.)	2.0	1.3	1.3	1.6
Coliforms (MPN/100 ml)*	3,500	6,100	10,000	7,300
B.O.D.(#/day)	19,800	14,000	14,800	14,400

* Log mean

Table V. Flow Data - Savannah River

10-year Record near Calhoun Falls, S. C.

Year	Min. Mean, Month	Min. Daily in Min. Month
1943-44	Oct. (2,698 cfs)	1,810 cfs
1944-45	Oct. (2,646 cfs)	1,710 cfs
1945-46	Sept.(2,616 cfs)	1,750 cfs
1946-47	Sept.(2,100 cfs)	1,080 cfs
1947-48	Aug. (2,607 cfs)	1,850 cfs
1948-49	Oct. (2,940 cfs)	1,730 cfs
1949-50	Aug. (3,330 cfs)	2,160 cfs
1950-51	Sept.(2,138 cfs)	1,050 cfs
1951-52	Oct. (1,728 cfs)	1,030 cfs
1952-53	Oct. (1,933 cfs)	1,320 cfs

Table VI. Wind Velocity Data

Greenville, S. C.

	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Annual
Mean Speed MPH (31 years record)	8.3	8.3	9.5	9.3	8.1	7.3	6.7	6.6	7.3	7.6	7.8	8.2	7.9
Prevailing Directions (6 years record)	SW	NE	SW	SW	SW	SW	SW	NE	NE	NNE	SW	NE	SW
Fastest Mile (MPH) (11 years)	73	56	56	66	65	52	60	70	47	79	52	48	79
Dir. of Fastest (11 years)	NE	NE	S	NW	SW	N	N	SE	NE	N	SW	NE	N
Year of Fastest	1948	1948	1952	1949	1952	1953	1951	1954	1950	1946	1947	1945	1946

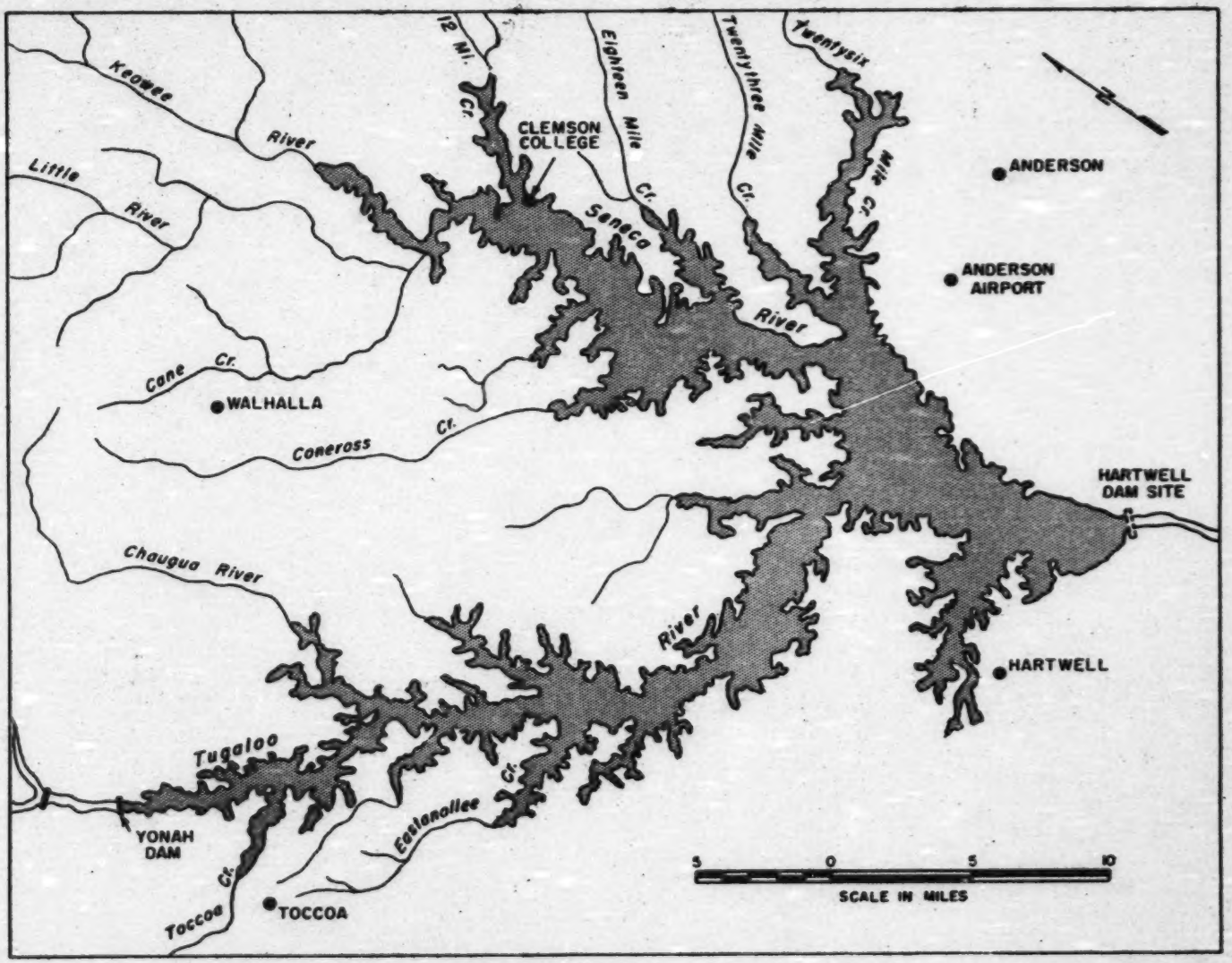
(Data furnished by U. S. Department of Commerce, Weather Bureau, Athens, Georgia.)

Table VII. Water Quality - Clemson Area

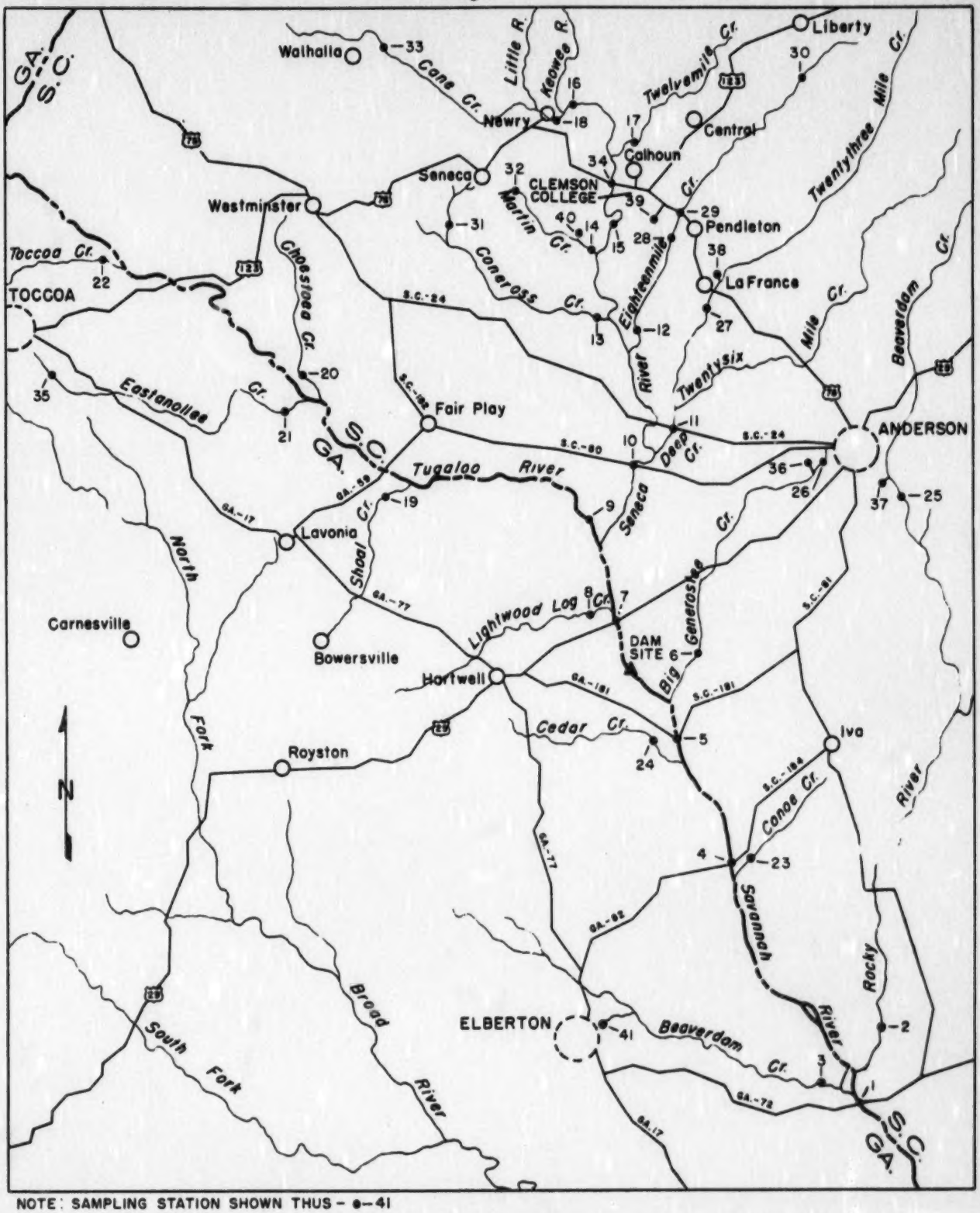
Averages of Individual Results

Station	16	17	34	15
Location	Keowee River Near Newry Above Clemson	Twelve-Mile Creek Near Mouth Above Clemson	Seneca River at U. S. Hwy. 76 Above Clemson Water Intake	Seneca River Below Clemson Sewage Outfalls
Discharge (cfs)	388	91	435	421
pH	7.1	7.1	7.1	7.1
Color	28	34	29	30
Chlorides (ppm)	0.9	1.8	1.1	0.7
Alkalinity (M.O.) (ppm)	13.7	17.3	13.9	16.4
Dissolved Oxygen (ppm)	10.51	10.60	10.56	10.55
Dissolved Oxygen (% Sat.)	92.1	92.7	91.8	92.7
Biochemical Oxygen Demand (5 day, 20°C.) (ppm)	1.2	1.5	1.5	1.8
Coliform Organisms (MPN/100 ml) (a)	7,200	23,000	6,400	>105,000

(a) log mean



HARTWELL RESERVOIR - IMPOUNDMENT AREA
(TOP OF FLOOD POOL, ELEVATION 665 FT.)
U.S.P.H.S. - APRIL, 1956
FIGURE 1

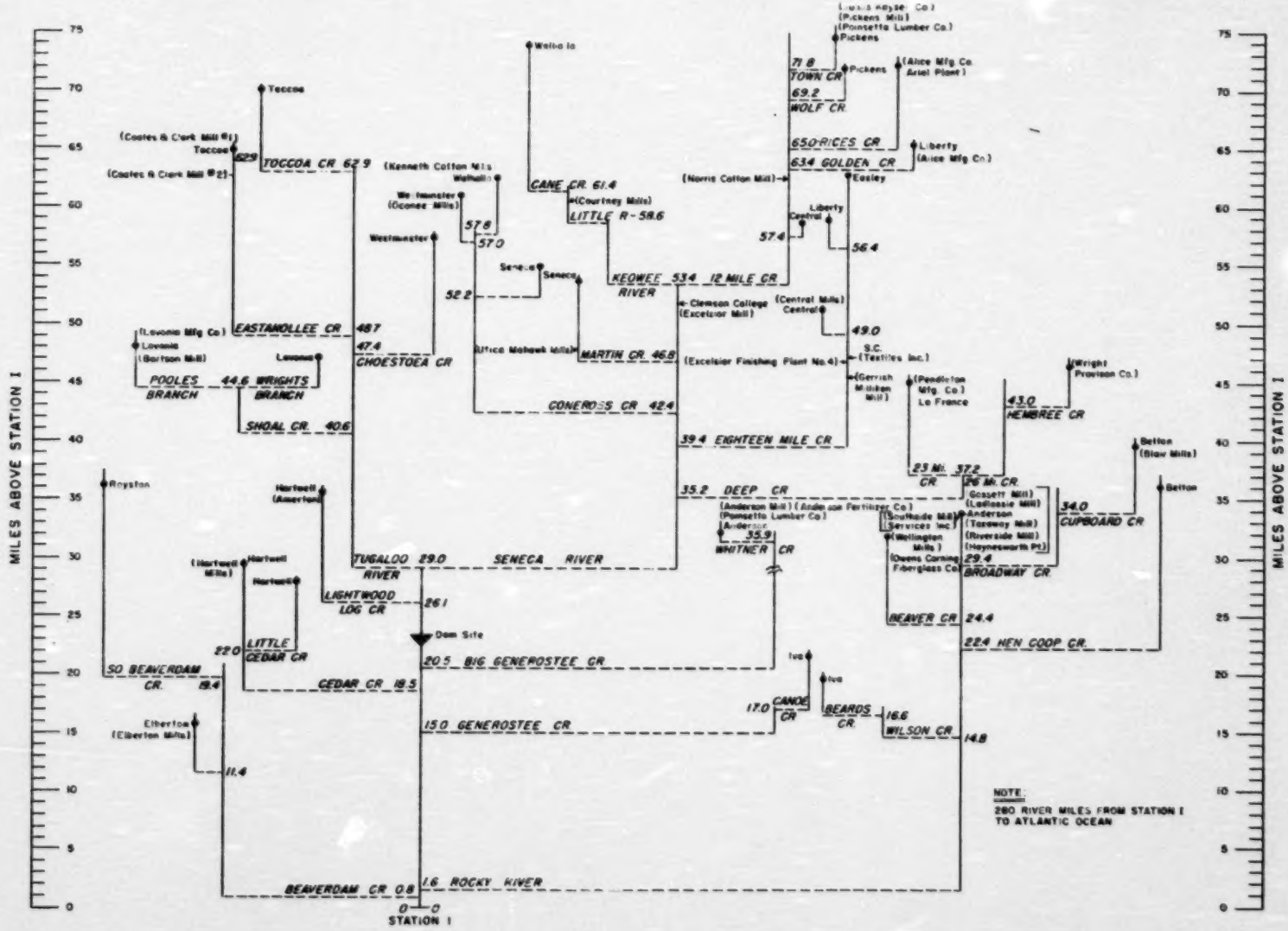


NOTE: SAMPLING STATION SHOWN THUS - •—41

HARTWELL RESERVOIR - SAMPLING STATION

U.S.P.H.S - APRIL ,.1956

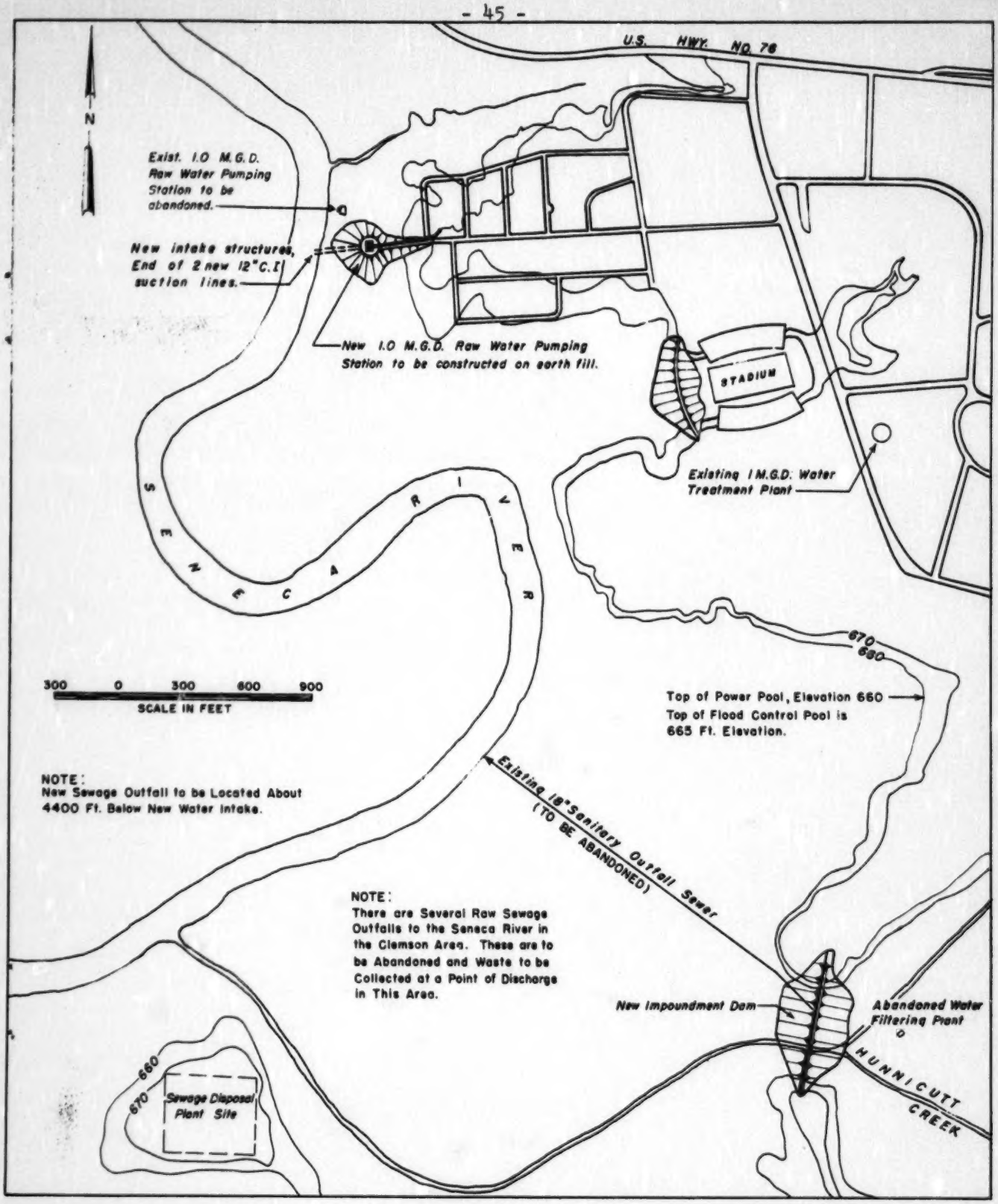
FIGURE 2



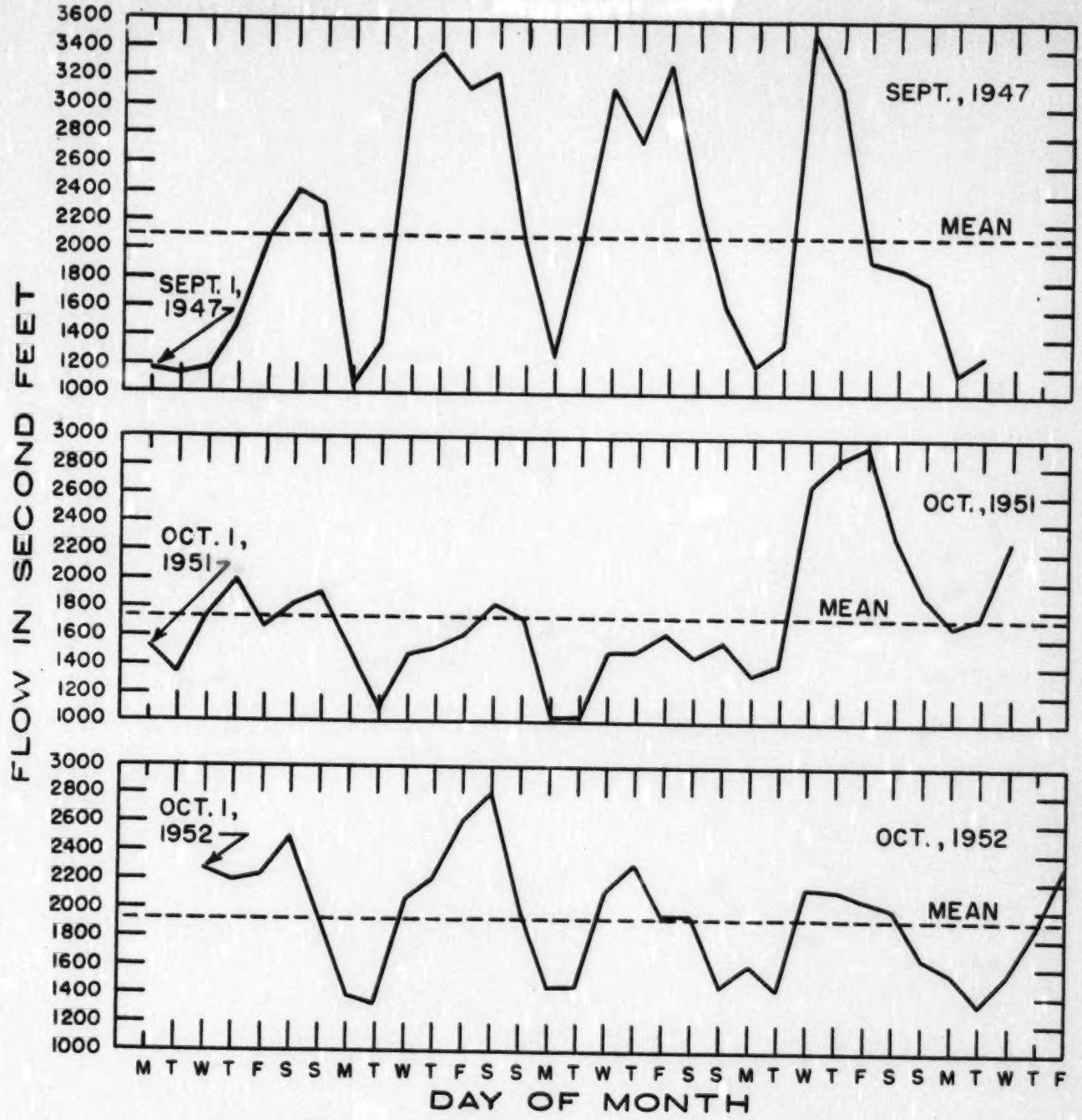
HARTWELL RESERVOIR – STREAM MILEAGE CHART

U.S.P.H.S. – APRIL, 1956

FIGURE 3


U.S. HWY. NO. 76
N
Exist. 1.0 M.G.D. Raw Water Pumping Station to be abandoned.
New intake structures, End of 2 new 12"C.I. suction lines.
New 1.0 M.G.D. Raw Water Pumping Station to be constructed on earth fill.
STADIUM
Existing 1 M.G.D. Water Treatment Plant
SENECA RIVER
670
680
300 0 300 600 900
SCALE IN FEET
Top of Power Pool, Elevation 660
Top of Flood Control Pool is 665 Ft. Elevation.
NOTE:
New Sewage Outfall to be Located About 4400 Ft. Below New Water Intake.
Existing 18" Sanitary Outfall Sewer (TO BE ABANDONED)
NOTE:
There are Several Raw Sewage Outfalls to the Seneca River in the Clemson Area. These are to be Abandoned and Waste to be Collected at a Point of Discharge in This Area.
New Impoundment Dam
Abandoned Water Filtering Plant
HUNNICUTT CREEK
660
670
Sewage Disposal Plant Site

HARTWELL RESERVOIR – CLEMSON AREA
U.S.P.H.S. – APRIL, 1956
FIGURE 4


FLOW IN SECOND FEET
SEPT., 1947
MEAN
SEPT. 1, 1947
OCT., 1951
OCT. 1, 1951
MEAN
OCT., 1952
OCT. 1, 1952
MEAN
M T W T F S S M T W T F S S M T W T F S S M T W T F S S M T W T F
DAY OF MONTH

FLOW DATA - SAVANNAH RIVER
(NEAR CALHOUN FALLS, SOUTH CAROLINA)
U.S.P.H.S. - APRIL, 1956

FIGURE 5

SUPPLEMENT

SUMMER CONDITIONS
LOWER SENECA AND UPPER SAVANNAH RIVERS
AUGUST 1956

SUMMARY AND CONCLUSIONS

1. This supplement presents the results of a resurvey of the Seneca River from Clemson, South Carolina, to its confluence with the Tugaloo River, and of the Savannah River from this point to the upper limit of Clark Hill Reservoir. The field work was conducted during August 1956.

2. Average stream flows during the August 1956, study were very low and were remarkably close to those for the first study in the fall of 1955.

3. Water temperatures were much higher during the August survey. They averaged 26°C, compared to 11°C for the previous fall survey.

4. Analytical results for August generally were in good agreement with those of the previous fall.

5. There are logical explanations for most of the limited number of cases where there appear to be significant differences between the two sets of data.

6. The August results do not in any way modify the conclusions (pages 1 and 2) based on the fall survey.

ACKNOWLEDGMENTS

The Department of Plant and Animal Sciences, Clemson College, provided laboratory space and various items of laboratory equipment for use in the analytical determinations. This cooperation is gratefully acknowledged.

The South Carolina Water Pollution Control Authority made preliminary contacts and arrangements for the use of the Clemson College laboratory. Through their contract with the U. S. Geological Survey they also provided the necessary data on stream discharges. This assistance is greatly appreciated.

INTRODUCTION

The previous portion of this report has dealt with a study of present water quality of the Savannah River between the Hartwell Dam site and the upper end of Clark Hill Reservoir, and the water supply and waste disposal situation at Clemson, South Carolina. The study was undertaken at the request of the Corps of Engineers, Savannah District Office, because of potential effects of Hartwell Reservoir on water supply and waste disposal in the area. Field work was conducted in the fall of 1955, from November 7 through December 9.

Subsequently the Savannah District Office requested a resurvey of the upper Savannah River and Clemson area conditions during a period of warm weather and low stream flows.

The resurvey was limited to the main stems of the Seneca and Savannah rivers. Field work was conducted during August 22 through 31, 1956.

FIELD INVESTIGATIONS AND PRESENTATION OF DATA

Sampling Stations

The stations sampled on the Seneca and Savannah rivers during August 1956, were the same as those used during the fall of 1955. Sampling procedures were the same at all stations with one exception. The previous data for Station 34 on the Seneca River above Clemson indicated that it was not necessary to sample three points across the stream for coliform organisms and samples for this examination were taken only at the mid-point during August.

Sampling Methods and Laboratory Analyses

Field procedures and laboratory methods were essentially the same for both surveys.

The analytical results obtained are presented in Table VIII.

Other Data

Stream flows were obtained by the same methods used in the previous survey.

No significant changes in sources of wastes are known to have occurred between the two survey periods with one exception. During the fall survey Clemson College was in session, with its regular complement of students. The August survey was conducted before the 1956 fall term started, and as a result the population contributing sewage to the Clemson system was considerably less during the latter period. Otherwise the data on sources of pollution assembled for the fall survey are believed to be valid for the August period.

ANALYSIS OF RESULTS

The averages of results for the two surveys are presented in Table IX for comparison.

General Comparison

The average stream flows for the two periods were so nearly the same that no variations in analytical results can be attributed to differences in discharge.

Average water temperatures of 25 to 27°C during August were much higher than those of 10 to 12°C during the previous fall survey period. These were normal for the seasons involved. The August temperatures were near the upper limit of the range to be expected for streams of this area. Higher temperatures normally cause more rapid exertion of oxygen demand by organic matter, with resulting greater depletion of dissolved oxygen. The dissolved oxygen saturation value of warm water (8.2 ppm at 26°C) is considerably lower than that for cold water (11.1 at 11°C). The per capita contribution of coliform organisms normally is greater in summer than in winter, but the organisms die off more rapidly in warm than in cold water. These opposing factors tend to balance each other in streams.

The results of color determinations reported are between 3 and 4 times as great during August as those during the previous fall. In August these streams carried a finely divided turbidity that could not be removed completely by centrifuging. This resulted in high readings that did not represent true color values. The fall averages in the range of 25 to 35 are probably more nearly representative of the true color, and are only slightly higher than might be expected in natural surface waters of this area.

Differences in pH, alkalinity, and chlorides, and in dissolved iron and manganese for the two periods were not significant.

Dissolved oxygen in ppm was lower, as would be expected with the higher temperatures. In per cent saturation, which provides a better basis for comparison, there was a significant difference only at Station 10 on the Seneca River. This is discussed below in connection with the Clemson area.

The biochemical oxygen demand was lower at every station during August than during the previous fall. This probably was due to the higher temperatures and resulting greater biological activity that

consumed organic matter more rapidly.

Coliform organisms at 5 of the 7 stations were in remarkable agreement. Considering the possible variations in results inherent in the method of examination greater differences might be expected even on duplicate samples. The differences found at the stations above and below Clemson are discussed below in connection with the Clemson area.

Savannah River

Results at the 4 Savannah River stations (Nos. 1, 4, 5 and 7) for the 2 periods revealed no significant differences in water quality. Differences in temperature and color, and minor differences in biochemical oxygen demand have been discussed above.

The greatest differences in dissolved oxygen were 6 per cent less saturation at Station 1 and 5 per cent less at Station 4 in August than in the fall. These two stations were the first sampled each morning in the August survey, whereas they were sampled alternately morning and afternoon in the fall survey. One source of dissolved oxygen in water is that produced by algal photosynthesis under the influence of sun light. Oxygen production by photosynthesis is less during early morning hours than it is later in the day. If these stations had been sampled later in the day during August the minor differences found in dissolved oxygen probably would have been even less.

The August data support in every detail the conclusions based on the fall survey for this section of the Savannah River.

Clemson Area

The August data for the Seneca River in and below the Clemson area showed differences from the fall data that may be considered significant with respect to coliform organisms above and below Clemson (Stations 34 and 15) and dissolved oxygen at Station 10.

There is no obvious explanation for the higher August average MPN of 16,000 coliform organisms per 100 milliliters above Clemson compared to 6,400 for the previous fall. Variations in coliform organisms of this magnitude are not uncommon. The higher August value merely emphasizes the previous conclusion that treatment of sewage discharged above the Clemson water intake is desirable for protection of the present supply.

The lower August average MPN below Clemson probably reflects the lighter sewage load from the town due to absences of college students at that time of the year.

The average dissolved oxygen per cent saturation of 73 per cent at Station 10 is of interest as an indication of upstream pollution. This was 16 per cent less than the 89 per cent saturation found at this station during the fall. It probably reflects the influence of higher temperatures in causing more rapid exertion of oxygen demand and therefore greater oxygen depletion some distance upstream. Since the nearest source of important organic pollution is nearly 13 miles upstream in Martin Creek (20,300 pounds per day of B.O.D. at Station 14) it appears that there must be significant oxygen depletion in the Seneca River between Station 10 and the mouth of Martin Creek.

Although evaluation of water quality in this section of Seneca River was not one of the objectives of this survey the possible implication of this observation was considered important enough to justify calling it to the immediate attention of the South Carolina Water Pollution Control Authority. This agency is conducting a study of the situation.

The minor differences between the August results and those of the previous fall in no way alter the previous conclusions regarding protection of the water supply and disposal of wastes in the Clemson area.

Table VIII. Tabulation of Laboratory and Field Data (August 1956)

Station Number	Station Description	Date	Temp. (°C)	Rate of Flow (cfs)	Color	pH	Alkalinity (ppm) Methyl Orange	Alkalinity (ppm) Phenolphthalein	Chloride (Cl^-) ppm	Diss. Fe ppm	Diss. Mn** ppm	Field Diss. Oxygen (ppm)	Field Diss. Oxygen % Sat.	B.O.D. (ppm)	Coliforms MPN	B.O.D. Day
1	Savannah R. at Calhoun Falls	8/22	25	2,180	70	7.4	15.8		1.00	0.35	0.105	7.51	89	0.77	2,300	9,060
		8/23	24	2,090	149	7.4	9.0		0.80	0.81	0	7.80	92	0.38	9,300	4,290
		8/24	24	1,890	158	7.4	17.0		1.00	0.90	0.065	7.70	91	0.48	4,300	4,890
		8/27	26	940	60	7.5	16.0		1.15	0.42	0	7.38	90	1.45	9,300	7,360
		8/29	26	1,440	102	7.4	15.8		0.95	0.90	0	7.51	91	0.82	15,000	6,380
		8/30	27	1,330	29	7.5	16.4		1.50	0.22	0	7.50	93	1.02	430	5,710
		8/31	27	2,020	60	7.5	15.8		1.50	0.42	0	7.41	91	1.10	2,400	12,000
(Average, August 1956)			26	1,700	90	7.4	15.1		1.13	0.57	0.024		91	0.86	3,900*	7,100
(Average Fall 1955)			11.8		25	7.4	19.9		2.4	0.45	0.08		97	2.0	3,500*	19,800
4	Savannah R. at S. C. Highway 184 near Iva, S. C.	8/22	26	1,870	159	7.4	14.2		0.55	0.78	0	7.54	91	0.80	24,000	8,080
		8/23	24	1,650	159	7.5	17.4		1.20	1.03	0	7.65	91	0.62	4,300	5,520
		8/24	24	1,320	159	7.5	16.0		1.00	0.83	0.155	7.83	92	1.20	15,000	8,550
		8/27	26	815	90	7.6	19.8		0.80	0.48	0.15	7.32	89	0.98	2,300	4,310
		8/29	26	1,020	45	7.6	15.8		1.30	0.42	0.155	7.98	98	0.82	2,400	4,520
		8/30	27	2,850	31	7.7	17.6		1.80	0.28	0	7.90	98	0.87	2,100	13,400
		8/31	27	1,710	26	7.5	14.6		1.50	0.27	0	7.79	96	1.59	4,300	14,700
(Average, August 1956)			26	1,620	96	7.5	16.5		1.16	0.58	0.066		94	0.98	5,000*	8,440
(Average, Fall 1955)			12.0		25	7.2	18.6		2.4	0.42			99	1.3	6,100*	14,000
5	Savannah R. at S. C. Highway 181	8/22	25	1,690	176	7.4	16.0		0.60	0.90	0	7.60	90	1.00	43,000	9,130
		8/23	24	1,860	191	7.5	17.4		0.85	1.09	0	7.85	93	0.70	43,000	7,030
		8/24	25	2,600	174	7.5	16.2		1.35	0.85	0.080	7.71	92	1.73	93,000	24,300
		8/27	26	800(est)	80	7.7	20.0		1.15	0.43	0.135	7.40	90	0.80	2,300	3,460
		8/29	27	1,020	34	7.6	16.2		1.00	0.32	0.110	8.04	99	0.84	2,400	4,630
		8/30	27	3,280	46	7.5	18.2		1.70	0.39	0	7.12	88	0.82	2,400	14,500
		8/31	27	2,410	35	7.5	15.2		1.05	0.19	0	7.67	95	0.76	4,300	9,290
(Average, August 1956)			26	1,950	105	7.5	17.0		1.10	0.60	0.046		92	0.95	10,000*	10,400
(Average, Fall 1955)			11.0		28	7.1	18.6		1.8	0.51	0.12		94	1.3	10,000*	14,800

(Continued)

Table VIII. Tabulation of Laboratory and Field Data (August 1956)

Station Number	Station Description	Date	Temp. (°C)	Rate of Flow (cfs)	Color	pH	Alkalinity (ppm) Methyl Orange	Alkalinity (ppm) Phenolphthalein	Chloride (Cl^-) ppm	Diss. Fe ppm	Diss. Mn ppm	Field Diss. Oxygen (ppm)	Field Diss. Oxygen % Sat.	B.O.D. (ppm)	Coliforms MPN	B.O.D. Day
7	Savannah R. at U. S. Highway 29	8/22	26	1,390	168	7.6	20.4		1.25	0.93	0	6.98	86	1.11	24,000	8,330
		8/23	25	2,140	186	7.5	15.6		0.85	1.19	0	7.31	87	0.92	9,300	10,600
		8/24	25	2,270	125	7.4	13.8		1.10	0.66	0.055	7.61	91	1.14	9,300	14,000
		8/27	26	746	74	7.6	18.0		1.40	0.58	0.135	7.60	93	1.08	4,300	4,350
		8/29	26	640	39	7.5	18.2		1.75	0.26	0.090	7.60	93	1.08	4,300	3,730
		8/30	27	2,680	34	7.4	17.8		1.50	0.38	0	7.37	91	1.71	2,300	4,580
		8/31	27	1,820	31	7.6	14.8		1.45	0.28	0	7.52	93	0.79	9,300	7,760
(Average, August 1956)			26	1,670	94	7.5	17.0		1.33	0.61	0.043		91	1.12	7,000*	7,620
(Average, Fall 1955)			12.0		26	7.2	18.1		2.3	0.55	0.09		95	1.6	7,300*	14,400
10	Seneca River at S. C. Highway 80	8/22	26	788	211	7.6	21.4		2.05	1.18	0	5.81	71	1.40	24,000	5,960
		8/23	26	726	227	7.6	20.6		0.75	1.49	0.135	5.96	73	1.43	24,000	5,610
		8/24	26	576	205	7.9	24.4		1.10	0.89	0.090	5.79	71	1.74	93,000	5,410
		8/27	26	529	99	7.7	20.2		1.10	0.62	0.145	6.51	79	1.62	9,300	4,630
		8/29	27	488	56	7.7	25.6		2.45	0.41	0.125	6.10	76	1.13	15,000	2,950
		8/30	28	657	52	8.0	27.8		2.50	0.44	0	5.54	70	2.16	9,300	7,660
		8/31	28	536	68	8.0	27.4		1.95	0.41	0	5.68	72	1.54	9,300	4,460
(Average, August 1956)			27	614	130	7.8	23.9		1.70	0.73	0.071		73	1.59	18,000*	5,240
(Average, Fall 1955)			10.7	614	36	7.4	21.8		2.4	0.54	0.10		89	1.8	23,000*	5,950
15	Seneca R. Belo. Clemson Composite Sample of 1/3 15L, 1/3 15M and 1/3 15R	8/22		635	236	7.2	10.2		0.45					1.03		3,530
		8/23		494	150	7.3	10.0		0.40					0.69		1,840
		8/24		422	116	7.3	11.4		0.90					1.57		3,580
		8/27		400	50	7.3	11.8		0.85					2.19		4,730
		8/29		486	50	7.3	10.6		0.85					0.90		2,360
		8/30		442	49	7.3	12.2		1.10					1.23		2,940
		8/31		403	42	7.4	12.0		0.90					1.19		2,590
(Average, August 1956)			26	469	99	7.3	11.2		0.78					1.26	79,000*	3,080
(Average, Fall 1955)			10.0	421	30	7.1	16.4		0.7					1.8	107,000*	3,860

(continued) Table VIII. Tabulation of Laboratory and Field Data (August 1956)

Station Number	Station Description	Date	Temp. (°C)	Rate of Flow (cfs)	Color	pH	Alkalinity (ppm) Methyl Orange	Alkalinity (ppm) Phenolphthalein	Chloride (Cl^-) ppm	Diss. Fe ppm	Diss. Mn++ ppm	Field Diss. Oxygen (ppm)	Field % Sat.	B.O.D. (ppm)	Coliforms MPN	20 D.O. Day
15L	Seneca R. below Clemson near left Bank	8/22	26									7.27	89		43,000	
		8/23	25									7.61	91		43,000	
		8/24	25									7.52	90		240,000	
		8/27	24									7.60	89		43,000	
		8/29	26									7.30	89		23,000	
		8/30	27									7.40	91		43,000	
		8/31	26									7.28	92		43,000	
(Average, August 1956)													90		50,000*	
(Average, Fall 1955)													93		95,000*	
15M	Seneca R. below Clemson Midstream	8/22	26									7.27	89		43,000	
		8/23	25									7.54	90		43,000	
		8/24	25									7.74	92		93,000	
		8/27	24									7.60	89		93,000	
		8/29	26									7.81	90		23,000	
		8/30	27									7.40	91		93,000	
		8/31	27									7.28	89		93,000	
(Average, August 1956)													90		61,000*	
(Average, Fall 1955)													92		130,000*	
15R	Seneca River below Rt. 76 Clemson near right Bank	8/22	25									7.25	86		240,000	
		8/23	25									7.51	89		240,000	
		8/24	25									7.56	90		43,000	
		8/27	24									7.57	89		430,000	
		8/29	27									7.46	92		93,000	
		8/30	27									7.30	90		93,000	
		8/31	27									7.17	89		240,000	
(Average, August 1956)													89		160,000*	
(Average, Fall 1955)													93		93,000*	

(continued)

Table VIII. Tabulations of Laboratory and Field Data (August 1956)

Station Number	Station Description	Date	Temp. (°C)	Rate of Flow (cfs)	Color	pH	Alkalinity as CaCO3 Methyl Orange	Alkalinity as CaCO3 Phenolphthalein	Chloride (Cl^-) ppm	Diss. Fe ppm	Diss. Mn** ppm	Dissolved Oxygen (ppm)	Dissolved Oxygen % Sat.	B.O.D. (ppm)	Coliforms MPN	B.O.D. #/Day
34	Seneca River	8/22		635	219	7.2	9.8		0.30					0.88		3,020
	U.S. Hwy. 76	8/23		494	162	7.3	10.0		0.80					0.54		1,440
	above	8/24		422	118	7.3	10.2		0.85					1.17		2,670
	Clemson	8/27		400	49	7.4	11.8		0.60					1.06		2,290
	Composite	8/29		486	46	7.3	10.8		0.75					0.80		2,100
	Sample of	8/30		442	47	7.3	11.8		0.90					0.65		1,550
	1/3 34L, 1/3 34M and 1/3 34R	8/31		403	50	7.4	11.4		1.80					0.80		1,740
(Average, August 1956)			25	469	99	7.3	10.8		0.74					0.84	16,000*	2,120
(Average, Fall 1955)			9.7	435	29	7.1	13.5		1.1					1.5	6,400*	3,740
34L	Seneca River	8/22	25									7.50	89			
	U.S. Hwy. 76	8/23	24									7.89	93			
	above	8/24	25									7.63	91			
	Clemson	8/27	24									7.76	91			
	Near left	8/29	26									7.85	91			
	Bank	8/30	27									7.46	92			
		8/31	27									7.43	92			
(Average, August 1956)													91			
(Average, Fall 1955)													92			
34M	Seneca River	8/22	25									7.30	87		46,000	
	U.S. Hwy. 76	8/23	24									7.76	91		15,000	
	above Clemson	8/24	25									7.62	91		24,000	
	Midstream	8/27	24									7.67	90		5,200	
		8/29	26									7.56	92		24,000	
		8/30	27									7.49	93		15,000	
		8/31	27									7.60	94		24,000	
(Average, August 1956)													91		16,000*	
(Average, Fall 1955)													92		4,800*	

(continued) Table VIII. Tabulations of Laboratory and Field Data (August 1956)

Station Number	Station Description	Date	Temp. (°C)	Rate of Flow(cfs)	Color	pH	Alkalinity (ppm) Methyl Orange	Alkalinity (ppm) Phenolph-thalein	Chloride (Cl^-) ppm	Diss. Fe ppm	Diss. Mn** ppm	Field Diss. Oxygen (ppm)	Field Diss. Oxygen % Sat.	B.O.D. (ppm)	Coliforms MPN	*B.O.D. Day
54R	Seneca River	8/22	25									7.41	88			
	U.S. Hwy. 76	8/23	24									7.70	91			
	above	8/24	24									7.81	92			
	Clemson	8/27	24									7.82	92			
	near Right	8/29	26									7.54	92			
	Bank	8/30	26									7.50	92			
		8/31	27									7.41	91			
(Average, August 1956)													91			
(Average, Fall 1955)													91			

* Logarithmic Mean.

** Interference encountered in manganese determinations rendered some results questionable.

Table IX. Summary Of Averages Of Results
Comparison Of Conditions In August 1956 and Fall 1955

Station Number	Date	Temp. (°C)	Rate of Flow(cfs)	Color	pH	Alkalinity (ppm) Methyl Orange	Chloride (Cl^-)ppm	Diss. Fe ppm	Diss. Mn** ppm	Field Diss.Oxygen % Sat.	B.O.D. (ppm)	Coliforms MPN*	5B.O.D. Day
1	Fall '55	11.8	1,750	24	7.3	19.9	2.4	0.45	0.07	97	2.0	3,500	19,800
	Aug. '56	26	1,700	90	7.4	15.1	1.13	0.57	0.023	91	0.86	3,900	7,100
4	Fall '55	12.0	1,930	25	7.2	18.5	2.4	0.42	0.16	99	1.3	6,100	14,000
	Aug. '56	26	1,610	96	7.5	16.5	1.16	0.38	0.066	94	0.98	5,000	8,440
5	Fall '55	11.0	1,970	28	7.1	18.6	1.8	0.51	0.12	93	1.3	10,000	14,800
	Aug. '56	26	1,950	105	7.5	17.0	1.10	0.60	0.046	92	0.95	10,000	10,400
7	Fall '55	12.0	1,680	26	7.2	18.1	2.3	0.55	0.09	95	1.6	7,300	14,400
	Aug. '56	26	1,670	94	7.5	17.0	1.33	0.61	0.043	91	1.12	7,000	7,620
10	Fall '55	10.7	614	36	7.4	21.8	2.4	0.54	0.10	89	1.8	22,000	5,950
	Aug. '56	27	614	130	7.8	23.9	1.70	0.78	0.071	73	1.59	18,000	5,240
15	Fall '55	10.0	421	30	7.1	16.4	0.7	-	-	93	1.8	105,000	3,860
	Aug. '56	26	469	99	7.3	11.2	0.78	-	-	90	1.26	79,000	3,080
34	Fall '55	9.7	435	29	7.1	13.9	1.1	-	-	92	1.5	6,400	3,740
	Aug. '56	25	469	99	7.3	10.8	0.74	-	-	91	0.84	16,000	2,120

* Logarithmic Mean.

** Interference encountered in manganese determinations rendered some results questionable.